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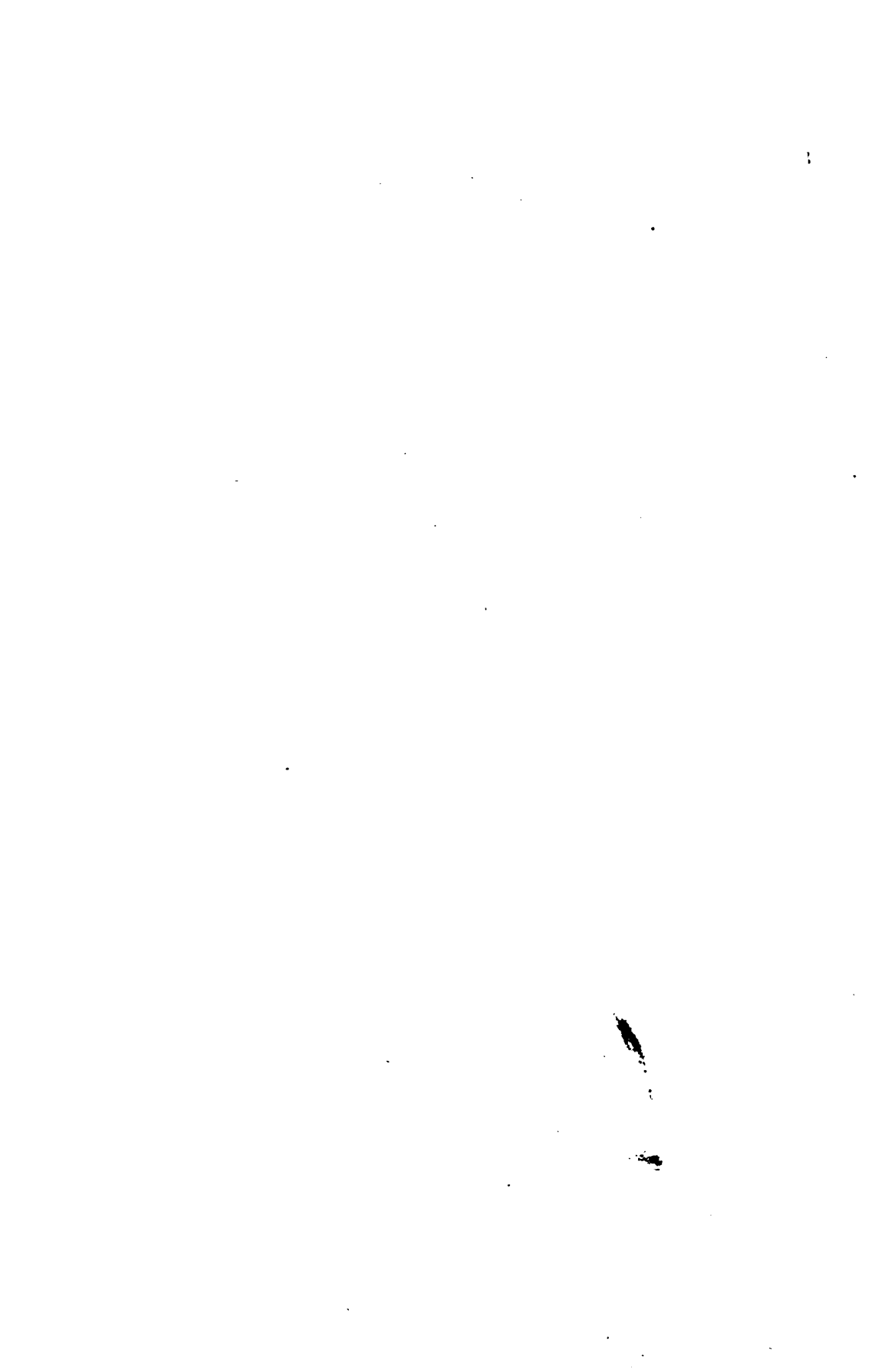
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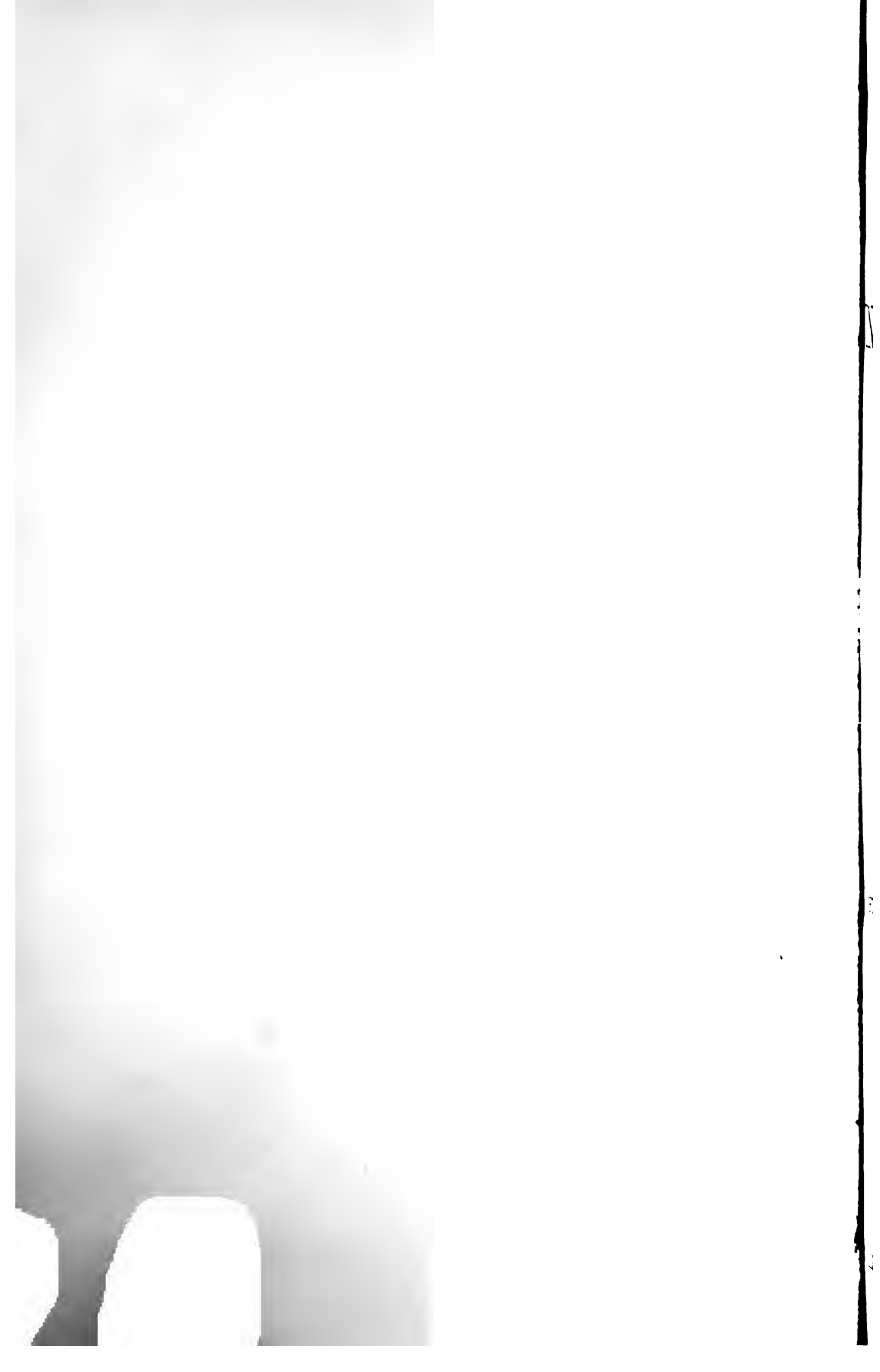
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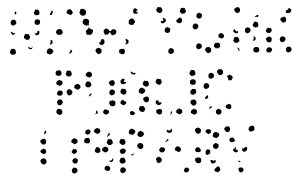


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AND OF THE



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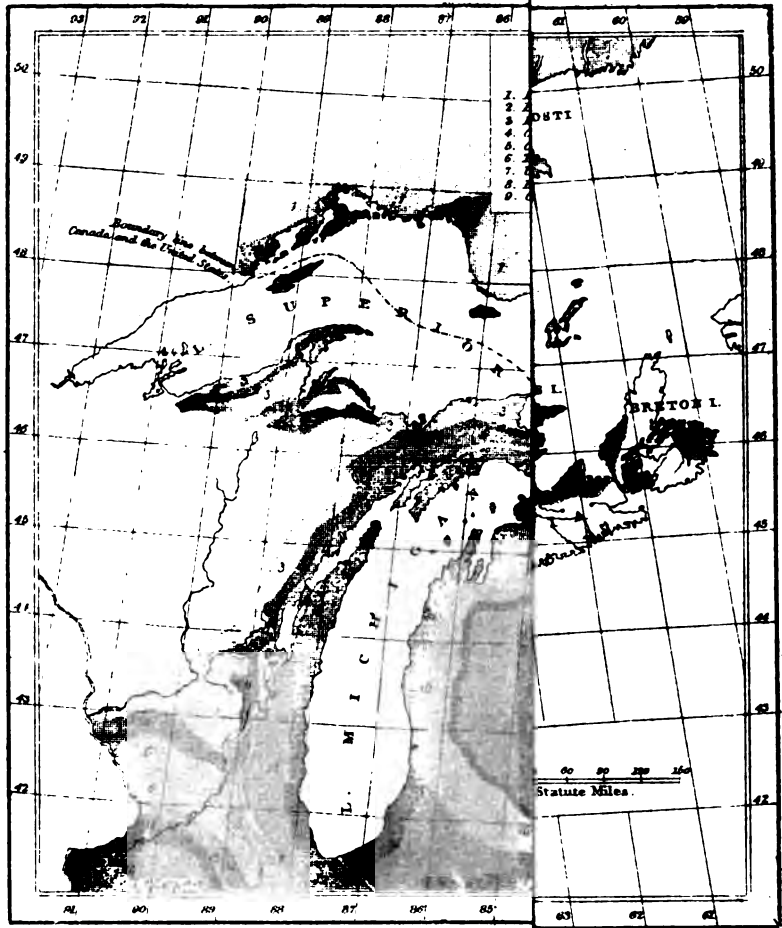
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THE INSTITUTIONS IN UNION.

No. 261.

FRIDAY, NOVEMBER 20, 1857.

Vol. VI.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 20, 1857.

NOTICE TO MEMBERS.

The Council hereby call a Special General Meeting of the Members of the Society, to be held at the House of the Society, on Tuesday, the 27th of December, at seven o'clock.

By Order,

P. LE NEVE FOSTER,
Secretary.

FIRST ORDINARY MEETING.

WEDNESDAY, Nov. 18, 1857.

The First Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 18th inst., Mr. C. Wentworth Dilke, Chairman of the Council, in the chair.

The following Institution has been taken into Union since the last announcement:—

47. West Brompton, Literary and Mutual Improvement Institution.

The CHAIRMAN said:—

Before proceeding to read the address of the Council, it appears to me that I should say a few words as to the reason of my appearance to night as chairman. This is not the time for any discussion on the subject—the meeting to-night, open to strangers, being restricted to hearing the address of the Council. It is, however, known, I resume, to all the members present, that extreme differences of opinion had arisen between the members of the Council and the chairman—on which the chairman was requested to resign. The circumstances will be explained in the Address of the Council. The Council were good enough to intimate their wish that I should accept the office thus vacated. I declined, because I knew that I was wanting in one qualification, at least,—the power of addressing public meetings. I was, however, assured that it was of far more importance at the present

moment to have a person in the chair who could attend to the business of the Society, and one known to have abstained, until the last moment, from taking part in the past angry discussions. Therefore it is that I am here, ready as I ever have been to do the work of the Society, and putting my trust in the good feeling of the members, that they will be tolerant of all my deficiencies and support me in maintaining the interests of the Society through its elected officers.

The CHAIRMAN then proceeded to deliver the following

ADDRESS.

In accordance with the Bye-laws of the Society, it is my duty, as Chairman of the Council, to foreshadow to you the views which the Council entertain of the policy which should be pursued by the Society during the present session to further the progress of the Arts, Manufactures, and Commerce, so far as our influence may extend.

The condition of India engrosses the public mind at the present time, and Parliament will doubtless consider the whole policy of its government. With that question the Council would not presume to meddle. But whatever affects the trade and commerce of that great empire and this country comes legitimately within the province of the Society to discuss. It is alleged that the system in force, until within the last quarter of a century, which prohibited any one under a heavy penalty from going to India to settle and embark his capital, still exerts a traditional influence in making it almost impossible, even at the present time, for any one to do so advantageously. It is alleged that the first requisite in developing the productive powers of any country is notoriously wanting in India, and that few, if any, adequate inducements are held out to British capitalists to construct railways, bridges, harbours, and docks, or to invest their money in that country. There is a strong feeling on this point in Manchester and other important seats of British industry. Without passing any judgment on the subject, the Council feel that the Society will be rendering good service by appointing a Committee to correspond with those who may be interested, and to bring before the Society

and the public any useful facts which may be elicited. The Council therefore propose to seek the co-operation of influential persons in the chief manufacturing towns of the country with a view to carry out this object. The Secretary has also been in communication with Dr. Buist, of Bombay, who has kindly undertaken to forward a communication to the Society during the present Session.

The extension of the railway system into India and our colonies within the tropics renders an inquiry into the nature and character of the various woods produced in those countries desirable, in order that a comparison may be instituted between them and those in ordinary use for railway purposes in Europe. It seems, also, desirable to ascertain the most effective and economic means of preserving such materials, when brought into use for sleepers, or any other railway purpose, against the destructive effects of extreme heat and moisture, and the ravages of white ants. It is further important to take measures for ascertaining, on the score of economy in construction, the practicability of extensively adopting in tropical countries the use of iron for railway purposes instead of wood.

The attention of the Council has been called to the reported failure of gutta percha as an insulating material for Electric Telegraphs in India and other hot climates, and it would seem desirable that every effort should be made to discover some new material, capable of resisting high temperatures, which may be adopted as a substitute. A paper by Professor Bleekrode, of Delft, recently published in the Society's *Journal*,* has thrown light upon the class of plants yielding this description of gum. The attention of chemists and manufacturers may well be directed to the importance of rendering these, or similar substances, suitable for use in hot climates. The Dutch Government have seen the importance of getting further information as to the supply of this important material from their colonies, and for this purpose have lately sent there an eminent chemist and naturalist, Professor De Vriese, to make investigations on the spot.

The subject of Indian fibres was ably dealt with by Dr. Royle, in his paper read before the Society last year, but the cost of carriage from the interior to the ports of shipment appears, hitherto, to have prevented their extensive introduction into our markets, though their value was fully proved by the sales at the London Commercial Sale-rooms, in February last.†

The active measures which have been recently taken to construct railways in India, though seriously interfered with by the mutinies, will, it is hoped, soon be renewed, and ultimately be the means of opening up to this country the commerce of the interior, and of affording faci-

ties for the more extensive introduction of British manufactures to the 150,000,000 of inhabitants of that country.

There has always been an intimate connexion between our Colonies and the objects of this Society, and in directing special attention to the subject of India during the Session, the Council would not have it inferred that subjects bearing on general colonial interests will receive less attention than hitherto. It is known that our manufacturers require increased supplies of cotton, wool, and hair, or substitutes for hair, and some of our colonial possessions may supply many new varieties of each, or animals may be acclimatised with this view. It would be extremely advantageous to the colonies, if the example of Mr. Chief Justice Temple, given last year, were more frequently followed, and information in reference to their natural resources and industrial products, were extensively collected by those whose position and influence enable them to do so with facility. The Council will gladly lend their aid in obtaining reports upon the uses and market value of any products that may be forwarded to the Society from any of our colonial possessions; they would be glad to receive samples of some of the finest cabinet woods from Australia and Tasmania, which they believe would, from their remarkable beauty, find a ready sale.

The recent failures in the European vine crops point to the desirability of encouraging the cultivation of the vine in our colonies generally. Considerable progress has already been made at the Cape and in Australia. Some useful suggestion in reference to this subject will be found in a recent number of the *Journal*.*

Late discoveries in Africa have excited much public attention, and a collection of the various kinds of cotton, wool, hair, dyes, vegetable oils, as well as the grain and minerals of that country, would possess peculiar interest. At a time when increased supplies of cotton are so much required, the importance of investigating the resources of a country which is known to be capable of producing this plant in large quantities, can hardly be over-rated. Should a collection of these products be formed, it is highly desirable that, in order to render it commercially useful, the cost of each specimen in bulk at the nearest sea-port should be mentioned, as well as the quantities in which it could be supplied.

In the year 1853, the Council received a communication from the New Zealand Society, in reference to New Zealand flax, placing fifty pounds at the disposal of the Society of Arts, and the Council have not been called upon to award this premium, and they would now direct attention to the offer lately made by the New Zealand government, of prizes amounting

* See vol. v., page 626.

† See *Journal*, vol. v., page 254.

* See page 672, vol. v.

to £4,000, of which particulars were recently published in the Society's *Journal*.*

The following are the prizes offered :—

£2,000 to the first person, and £1,000 to the second person who shall, by some process of their own invention, produce from the *Phormium Tenax*, or other fibrous plants indigenous to New Zealand, one hundred tons of merchandise; and £200 to each of the first five persons, other than those entitled to the first and second rewards, who shall by any process, whether of his own invention or not, produce from the *Phormium Tenax*, or other fibrous plants indigenous to New Zealand, twenty-five tons of merchandise.

"The merchandise must be saleable as an article of export from the Colony of New Zealand, and have been produced at a cost not exceeding 75 per cent. of its value at the port of entry from which it is exported; and the process used must be fully made known with a view to the discovery being at once made available to the public."

With reference to this subject, as well as to the general products of this Colony, the Council have arranged for a paper to be read before the Society, during the Session, when it is hoped that some useful information will be given as to the peculiar characteristics of the New Zealand flax, and the present mode of operating upon it, and which may tend to forward the object of the New Zealand Government in offering these premiums.

Having thus touched upon what may be called the foreign policy of the Society, the Council will next direct attention to some subjects of interest nearer home. With reference to the Evening meetings, the papers to be read previously to Christmas, are as follows.†

In addition to these, the Council hope to bring forward, among other subjects of interest, that of noxious trades generally, the recent discoveries in science and their application to the Arts and Manufactures, refuse materials and their re-conversion, metropolitan telegraphs and their economical construction, the past and present state of French agriculture, and many others. A further communication on the natural resources and industrial products of British Honduras, is expected from Mr. Chief Justice Temple.

The Council have not lost sight of the important question of the Amendment of the Patent Law, and of the tax which it imposes upon inventors seeking that protection, which tax is absorbed in the general revenue of the country, through the department of stamps and taxes. If any greater fund is to be raised than may be necessary to pay the working expenses of the office, after the large compensations secured by the present Act to the law officers shall have lapsed, all parties are agreed that such surplus

ought not to go to the general exchequer, but to the promotion of invention. At the present time, this surplus is many thousands a-year, which have unexpectedly arisen from the reduction of the old patent fees to chaff-wax and others, and this has been carried by an ingenious mode to the credit of the public revenue. Now there are two obvious modes of applying this surplus fund, if we must have a surplus. First, to assist the Mechanics' Institutions with the means of providing a better class of education, and, secondly, to provide proper buildings, not only in the metropolis, but in the provincial seats of manufacture, to exhibit models of patented inventions. In less than five months, 200,000 persons have visited the experimental temporary patent Museum at South Kensington: sufficient proof has been afforded of the interest taken by the public in this collection, to justify the immediate provision of a suitable public building to exhibit patent models. The Council propose, therefore, to re-appoint a Patent Committee to watch this subject, and rescue the surplus fees from the present unfair system of appropriation.

The Council also feel that the Society might render considerable benefit to Art if it would take in hand the equitable adjustment of the law of copyright in Art production. First, by collecting proper information on all matters connected with this important subject and, secondly, by bringing all its influence to bear in order to a thorough settlement of the whole question. As it is, these laws are most unequal, affording protection in some cases and utterly neglecting others, and thus inflicting serious injury on the purchasers of Art as well as upon the artist. Prints and engravings enjoy a tolerable degree of protection under the 8 Geo. 2, extended and enforced under the 7th and 17th of George 3rd, but still requiring much revision. Sculpture enjoys some degree of protection under the 38th of George 3rd, and under the 54th of the same king, as well as some also under the recent Act for the registration of designs. But the painter has no protection, as has been shown but too fully by many recent transactions, as in the injury done to Mr. F. R. Pickersgill, Mr. Ward, and Mr. Linnell. It appears that any person may make and sell a copy of any picture that has passed out of the artist's hands; or even if the copy has been surreptitiously made while the picture was in his possession, he has no means of preventing the sale of it. Moreover, any such copy may be engraved without his consent, and the artist has no remedy, neither can he control the sale: or his picture may be photographed, and either retailed by this means, or by means of engraving from the photograph; so that when once his picture has left his own secure custody, he has no legal means of enforcing any claim he may have reserved as to the right of engraving it, or any protection by which it

* See Vol. v., p. 328.

† See *Journal*, Vol. v., p. 681.

benefits arising from his own mental labour is secured to him.

The proposal made, some years since, for a parcel postage, has not yet been carried out. This is an important question, as affecting the commercial and manufacturing interests of the country, and might form a legitimate subject for discussion, particularly in reference to the circulation of patterns.

The importance of increased facilities for conveying the heavy goods traffic of London, and relieving the present thoroughfares, points to the necessity for opening up new lines of communication; and the drawings which surround this room, show that the Metropolitan Board of Works is actively engaged in the furtherance of this object: the Council of the Society had great pleasure in placing the rooms at the disposal of the Board for this exhibition. Members of the Society will doubtless remember the able paper which was read before them, last session, on the Thames embankment and metropolitan improvements generally, as well as the valuable suggestions offered in another communication with regard to metropolitan railways. The Council have reason to believe that these papers have been the means of drawing special public attention to the subject, and they will still be glad to lend their aid in the important work of rendering the thoroughfares of this metropolis adequate to the requirements of its ever increasing traffic. Other departments of metropolitan improvement, such as water supply, lighting, and improved arrangements for the supply of provisions, may also usefully occupy the attention of the Society.

The recently-published report of Professor Hunt, on the "Mineral Statistics of the United Kingdom,"* naturally suggests the importance of studying the means of economising the use of coal, and of obtaining economical substitutes for it, for the ordinary purposes of heating and lighting. The desirability of economising space in the holds of steam-vessels is also involved in this question, upon which the Council will be glad to receive communications.

The Council have it in contemplation to appoint a Committee to examine into the present state of the law and practice of shipping insurance, as affecting the advancement of naval architecture, and commerce, and the interests of merchants, commanders, and seamen. This Committee might also consider the present classification and registration of ships, with a view to the advancement of the character of our shipping, and the general interests of commerce, as well as the state of the education of seamen, and the means of improving it, both in a moral, scientific, and practical point of view. The nature and bearing of the public and local taxes on ship-

ping, and their influence on the character of shipping and commerce generally, as well as points of a general nature in the mechanical arrangements for working, ventilating, and rigging ships which may seem capable of improvement, would naturally occupy the attention of such a Committee.

The intimate connexion between Arts, Manufactures, and Commerce, naturally leads to discussion of questions affecting their relation with each other. Thus, certain points of social science and political economy have from time to time, occupied the attention of the Society, and papers have been read on the international commercial impediments which arise from fiscal exactions, and diversity of standard currency, and of weights and measures. During the ensuing session, these and other cognate subjects will probably be brought under consideration, though it may be difficult at this moment to indicate the precise form which they may assume.

The third award of the prize of "a silver goblet, value 100 guineas, containing gold equal to the same amount," will be made, in accordance with the will of the late Dr. Swiney, January, 1859, and the conditions will be shortly advertised.

The Council desire to draw attention to special prizes which were announced for competition during the last Session. The first of these consists of a prize of 200 guineas, placed in the hands of the Council by Mr. Henry Johnson, to be awarded for "The best Essay on the present financial position of the country as affected by recent events, in which the principle of a sinking fund should be discussed, and also an investigation made as to the best mode of gradually liquidating the National Debt." The Essays are to be sent to the Society of Arts by the 31st day of December, 1857.

The other two prizes consist of sums of £10 and £20 respectively, which have been placed in the hands of the Council by Sir W. C. Trevelyan Bart., to be awarded for "The two best and most improved Essays on the applications of the Marine Algae and their products, as food or medicine for man and domestic animals. Competitors must give the results of their original investigations on sea-weeds (especially on the chemistry of the nutrient principles); and they must prepare a series of specimens illustrative of the best mode of collecting, preserving, and preparing nutritive species in a state fit for food. Medicinal compilations will not be admitted to competition."

The Essays, with accompanying specimens, are to be sent to the Society of Arts by the 31st day of March, 1858.

In reference to the last mentioned prizes, the Council desire to draw attention to the letter from Sir John Bowring and Dr. Macgowan

* See *Journal*, Vol. v., p. 665.

which were published in a recent number of the *Journal*.*

The Council are happy to draw attention to the benefit which the public is now deriving from the results of the Educational Exhibition, suggested by Mr. Chester, and carried out by the Society in the year 1854, in St. Martin's Hall. The collection then presented to the Council by the exhibitors, has formed the nucleus of the present Educational Exhibition at South Kensington.

It will be remembered that one of the Society's Vice-Presidents has been for some time engaged in preparing a collection of articles and illustrations, designed to familiarise the working classes with the means which science and commerce present for improving their condition as to dwellings, furniture, and household utensils, their food and clothing, and the sanitary considerations involved in their domestic and industrial life. The materials thus got together as the nucleus of an Economic Museum, were some months ago placed by the Council at the disposal of the Committee of the Privy Council on Education, under an impression that, from the explanatory and instructive manner in which they were intended to be labelled and classified, they might suitably form part of the Educational Museum at South Kensington. Many obstacles have hitherto prevented their complete exhibition, particularly the want of available space, Mr. Twining's ill-health, and other unforeseen circumstances; nevertheless, a portion of the food department has been shown on a small scale, so as to give an idea of the kind and amount of usefulness which might ultimately be expected from this and other portions of the collection.

A certain number of illustrations also of model dwellings and a few fittings are exhibited in another part of the building. Other materials are in preparation, and it is to be hoped that a slow, but persevering progress will ultimately realise, either at Kensington or elsewhere, a complete series of illustrations of every-day life, offering to the working classes in an attractive form the kind of instruction they so much require.

The Council have now to make some statements respecting the Examinations and the Board of Examiners.

As the present meeting is not confined to members of the Society of Arts, it is not a meeting for discussion; and, on this ground, the Council had hoped that it would not be necessary, in this address, to enter into any details which might provoke a desire to reply; but that a full statement of all that has occurred, and of all that is proposed by the Council, in reference to the Examinations and the Examiners, might be reserved to the special meeting to which the whole matter must be speedily referred, and the Council have now to announce that the day fixed for that

meeting is Tuesday, the 1st of December, at 7 o'clock.

Recent circumstances, however, compel the Council, on this occasion, to enter into the details more fully than had been intended; and, if the inconvenience of being prevented from replying at once to what may be said, is felt by any one, it must be remembered that this course has been forced on the Council, who have no hesitation in saying that they feel themselves to have been entirely misrepresented by their late Chairman.

The plan of Examinations which the Council originally proposed, and which the Conference of the representatives of the Institutes in Union with us unanimously approved of in 1854, was drawn up by Mr. Chester, with whom the Union of Institutes had originated. It was a plan for Examinations, by printed papers, under the authority of the Society of Arts, at such places throughout the Union as could make suitable arrangements for the satisfactory working of the papers.

That plan was intended to be brought into operation in the spring of 1855; but, from causes which had little or no bearing upon the merits of the plan, did not come into effect at that time. In the summer of 1855, Dr. Booth was appointed Chairman of the Council, and brought the plan into operation, but in doing so he introduced into it some important modifications. Of these, by far the most important was the addition of *oral* examination to the original plan of examination by papers, and this combined system of oral and written examination was then tried at a single centre, viz., in this House, in June, 1856. The experiment was successful as far as it went, but the representatives of the Institutes who attended the Conference in June of that year, almost unanimously expressed their opinions that the peculiar wants of our Institutions would be met by no system of examination which was not capable of being brought home to their doors.

In the summer and autumn of 1856, the Council were invited to extend the examinations to various places in the following year, and the Board of Examiners recommended that they should be held, oral and written, at four places, including London. The Council, however, who alone have the data for deciding what the Society of Arts can do, felt themselves unable to accept this advice, and resolved that, in 1857, there should be only two centres of examination, London and Huddersfield, at which places examinations were accordingly held in June last, and the Society and the Institutes in Union are deeply indebted to the Examiners for their very valuable services, which were rendered gratuitously.

Soon afterwards, however, the Council found themselves brought into a position of great embarrassment. They became aware that Dr. Bo who was at once Chairman of the Council ar

* See page 657, Vol. v.

the Board of Examiners, had in public speeches and in various parts of the country, and in published papers during the vacation, led the public to expect that the Society was about to do what the Council had not decided to do, and, more than that, did not think right to expedient, or even possible to be done. It also appeared that he, without any authority from the Council, and without communicating with the Secretary, had inserted in the Society's *Journal* an advertisement of the programme of the Examinations for 1858, with a table of contents from which it could not but be concluded that the Society had decided to confer the title of "Associates" on the Society of Arts upon those young men who might obtain certain certificates from the Board of Examiners, and also that he had sent out to various provincial towns, without authority, that the Society would hold oral and written examinations there in the ensuing year. Various of these points had been brought before the Council. It further appeared that a copy of this programme, before the Council, had been sent by Dr. Booth to several persons out of the Council; and letters were received by the Secretary from young men in various towns stating that they had been informed that the Society had decided to create "Associates."

On the 5th of September, the draft of the proposed programme was sent up from the Board of Examiners to the Council. The Council have since ascertained that this very important document—which assumed the creation of "Associates"—which specified five places at which the Council were to hold oral and written examinations in 1858—and which provided for the examination of the pupils of commercial schools, through the *Interim* which was proposed to carry the programme, had been sent to the examiners in private, without any intimation of the gravity of those points, and had only once been before a meeting of the Board, which meeting was held on September 5th, the day the draft was forwarded to the Council, and consisted of only four examiners, including Dr. Booth, just one-third part of the Board.

The programme came before the Council at their first meeting after the vacation, viz., on the 5th of September last, as stated above. Dr. Booth and nine other members of the Council were present.* Exception was immediately taken to the Committee's proceedings, previously alluded to, as embarrassing to the Council, and he admitted that he had acted inadvertently.

Objections to the proposed creation of "Associates" were very generally expressed. It was thought wholly unsuitable to the character of the Society, and likely to bring ridicule upon those who should bestow, and upon those who should bear, the title. No member of the Council but Dr. Booth defended it. He stated that the system of Examinations was, in his judgment, the only thing left to the Society to do; and that the time had gone by in which it could usefully promote the encouragement of Arts, Manufactures, and Commerce. It is needless to say that this sentiment was not echoed in the Council. After considerable discussion, it was resolved that a special meeting of the Council should be summoned for the further consideration of the "programme," particularly with reference to the questions of Associates and of centres of oral and written examination. That meeting was held on the 8th of October. Dr. Booth was again in the chair, and ten other members were present.*

Dr. Booth withdrew the proposal of Associates; and, after a very long discussion, it was unanimously resolved to request the Board of Examiners to explain to the Council by what means the Board proposed to carry out the plan of oral and written Examinations, at five centres, in 1858; and to furnish a detailed statement of the probable cost.

On the 28th of October the Council met to receive the Examiners' report. There were present Dr. Booth in the chair, and fourteen other members, an unusually large number.† A very full and long discussion occupied almost all the evening; and at length the following resolution was carried by a majority of 12 to 1, Dr. Booth being the only dissentient:—

"The Council having fully considered the subject of oral and written Examinations, and the report of the Board of Examiners thereon, are of opinion that oral Examinations cannot be satisfactorily conducted by this Society at four centres besides London, simultaneously."

The main reasons for the adoption of this resolution were—1st, The expense of sending out the requisite number of Boards of Examiners to great distances from London; 2nd, The impossibility of procuring the services of so many Examiners of equal authority, certain to give uniform judgments, at one time in different and distant places; and 3rd, The very small extent to which even these five centres could supply

* Present:—Rev. Dr. Booth in the chair, Mr. Bennoch, Mr. Chester, Mr. J. Griffith Frith, Mr. James Glaisher, Mr. Peter Graham, Mr. Marshall, Mr. Macdonald, Colonel W. H. Sykes, Mr. Wilson, and Mr. Winkworth.

† Present:—Rev. Dr. Booth in the chair: Mr. Bennoch, Mr. Chester, Mr. Henry Cole, Mr. C. Wentworth Dilke, Mr. Frith, Mr. Glaisher, Mr. Glynn, Mr. Peter Graham, Mr. W. Fairbairn, Mr. W. Hawes, Mr. Macdonald, Mr. Marshall, Mr. Wilson, and Mr. Winkworth.

* Present:—Rev. Dr. Booth in the chair, Mr. F. Bennoch, Mr. Henry Chester, Mr. J. Griffith Frith, Mr. Peter Graham, Mr. James Glaisher, Mr. J. C. Macdonald, Professor Edwin Smith, Mr. G. F. Wilson, and Mr. Thomas Winkworth.

he wants of the Institutes which are scattered all over the United Kingdom.

It was then resolved that the foregoing resolution be communicated to the Board of Examiners, and that they be requested to prepare a scheme of examination by papers only. With this request Dr. Booth advised the Examiners not to comply; and they declined compliance, alleging that they were going "out of office within a week from this time" (Nov. 4th), to use the words of their own resolution.

On the 5th inst. the Council met, by special summons from the chairman, to consider the following resolution, "and for the further consideration of the programme." The proposed resolution was as follows:—

"That the subscriptions received from the Mechanics' and other Institutions in union with the Society of Arts, either directly or indirectly through their presidents or other officers, be from this present Michaelmas set apart from the ordinary income of this society, and be called the 'Institution Fund.' That all necessary expenses incurred in the management and organisation of the examinations, or other measures for the benefit of the Mechanics' Institutions, be defrayed out of this fund. That a committee, selected from the Council and Board of Examiners, be charged with the administration of it; and that a detailed audited account of the income and expenditure be published annually, in November, and furnished to every Institution in union."

There were present, Dr. Booth in the chair, and ten other members.* When the Chairman rose to move his resolution, he was met *in limine* by the objection that it was at variance with the charter, and could not be proposed. After all the members present had shown their concurrence in this objection, and it had been much discussed, Dr. Booth was asked whether he would not withdraw his resolution. He declined to withdraw it, and it was then voted, Dr. Booth alone dissentient, that the resolution was illegal and could not be put. A protracted and painful discussion ensued, in the course of which Dr. Booth avowed that he took no interest in any of the Society's objects except the Examinations; and at last, on the grounds which have been now stated, and for other reasons stated to Dr. Booth at the meeting, a requisition, signed by every member present, was handed to the chairman, requesting him to resign the chair. The meeting was then adjourned to the following day.

On the 6th instant there were present seven members,† the members absent on the 5th having been specially summoned to the adjourned meeting. The meeting being by adjournment, the special business for it was "the further consideration of the programme." Any

matter, therefore, that the programme contained was properly before the meeting. The Board of Examiners was a part of the programme. The meeting was, therefore, fully competent to deal with that subject. The attention of the Council was called to the constitution of the Board of Examiners in reference to the *new* Bye-laws which were then about to be brought into operation *for the first time on the 11th inst.* Portions of the Bye-laws relating to the Board were shown to be clearly illegal. They constituted the Board an independent body, remaining in office when every other officer, from the president downwards, goes out of office; fixing their own number, which the Council have no power to alter; nominating themselves, the Council having no power of nomination but only of rejection of individuals; choosing their own chairman, and giving to him, who need not even be a member of the Society of Arts, a right to attend at every meeting of the Council. The Society need not be informed that the Charter vests the absolute control of the Society's affairs in the Council, and that no bye-law is valid in so far as it contravenes the Charter.

The Council were aware that the Board of Examiners, at its last meeting, had settled a list of *proposed* Examiners, which was to be subjected to the ballot of the existing members of the Board on the 11th instant. That list contained 63 names, which, however, might have been reduced on the ballot. If the meeting on the 11th had taken place, the Council could not have altered the number of Examiners sent up to it, and every gentleman who was appointed would have been appointed on an illegal basis, and would have been in a false position. The Board could meet on the 11th, under the Bye-laws, only to nominate their successors, and then to expire; and the Council thought it to be their duty to take care that the successors were not appointed until the Society had had an opportunity of bringing the bye-laws into harmony with the Charter. That opportunity could not be given until a sub-committee had been enabled to re-cast them, and until the time prescribed for the holding of special meetings had elapsed. The Council, therefore, took the only course that was open to them. The existing Board of Examiners was within a few days of its termination, and could only meet to do that which would be illegal and embarrassing to the Council and to the future Board. The Council, therefore, thought it necessary to inform the Examiners that the meeting could not be held.

On Nov. 11th the Council, specially summoned, again met, eleven in number,* and unani-

* Present:—Rev. Dr. Booth in the chair, Mr. Chester, Mr. Cole, Mr. Dilke, Mr. Peter Graham, Mr. Hawes, Mr. Macdonald, Mr. Marshall, Mr. T. Twining, Mr. Wilson, and Mr. Winkworth.

† Adjourned Meeting. Present:—Mr. Dilke, in the chair, Mr. Chester, Mr. Cole, Mr. Hawes, Mr. Macdonald, Mr. Marshall, and Mr. Twining.

* Present:—Mr. Chester, Mr. Cole, Mr. Dilke, Mr. Frith, Mr. Glaisher, Mr. Glynn, Mr. Hawes, Mr. Macdonald, Mr. Twining, Mr. Wilson, and Mr. Winkworth. Mr. Cole in the chair, *pro tem.* Mr. Dilke was elected Chairman, and took the chair.

mously and by resolution, confirmed the proceedings of the previous meeting.

The Council have never entertained the notion of suppressing the Board of Examiners, or of discontinuing the examinations, or of connecting them with the Government. The Council are about to put them upon a footing which will render them capable of being extended to any degree that the Institutes in union may require. The pupils of commercial schools will no longer be admitted to the Examinations which are designed for the Institutes united to us. By what we now propose, the growth of local authority in education will be developed; and it may be hoped that out of these measures may grow an important incorporation of Institutes, based on local authority, and capable of meeting exactly their wants in regard to education. The amended programme for the examinations of 1858 will be published with the least possible delay. The Prize Fund for 1858 will take effect over the whole range of the Union, and may, therefore, with advantage be large. The Council will be happy to receive contributions to this fund.

The Council are strongly of opinion that, while the incidental business of the Examiners should be managed by the Council and their officers, and not thrown on the Examiners, those gentlemen should not any longer be asked to render their valuable services in the real work of examination without a fair honorarium.

In conclusion, it becomes the pleasing duty of the Council to announce the medals that have been awarded during the last Session, and in doing so they desire not only to convey the thanks of the Society to the gentlemen whose papers have been deemed worthy of this special mark of recognition, but also to acknowledge the obligation which the Society is under to the authors of other interesting communications which have been brought under its notice both at the evening meetings and in the columns of the *Journal*.

The medals awarded at the close of the last Session were then presented.

The Secretary announced that, at the Meeting on Wednesday, the 25th inst., the following Paper would be read:—"On the Composition and Relative Value of the Food Grains of India," by Dr. Forbes Watson. On this evening Dr. Lyon Playfair, C.B., F.R.S., will preside.

PAPER DUTIES.

The intention of the excise on paper was that it should be an equal duty on all paper, according to weight, and without reference to the purpose to which such paper is to be applied. In all manufactures from paper, it is manifest that there will be more or less waste: these manufactures would naturally, for the most part, be carried on after the paper has left the mill, and there

would be a duty paid upon the waste. The duty is levied to get as much revenue as possible, and without reference to the value of the paper, much less to the value that may be conferred on it by any additional process; there is, therefore, no inconsistency in taxing the waste, any more than in taxing the paper used in any manufacture. But when such manufacture is carried on at a paper mill, the waste is cut away before the paper is charged, and pays no duty: this is strictly according to law, for the law requires only that what goes out of the mill should be charged,—but it is manifestly an interference with the freedom of manufacture, that an envelope-maker (for instance) who makes envelopes at his house should pay a tax which is avoided by the owner of a paper mill; the effect, of course, will be to give the large capitalist not only the advantage of his capital, in which he is fairly entitled, but to place on the small envelope-maker a burden of taxation from which the mill-owner is exempt.

Printing at the paper-mills stands exactly in the same position as making envelopes there; but this has generally been prohibited by the Board of Inland Revenue, and it is even required that a mill for staining paper shall be a certain distance from one belonging to the same owner where paper is made,—though there is no word in the Act to support this exercise of authority, or to prevent the paper from being printed or stained at the paper-mill, and charged after it is printed. Permission to do this has occasionally been granted as a favour: some are of opinion that it may be claimed as a right, and that, if a seizure were made in consequence, and referred to the Court of Exchequer, judgment would be given for the defendant.

Another anomaly is the taxing articles exactly like those which are untaxed, so that the taxed one is driven out of the market. The paper which was formerly used for sheathing ships, and which is still used for roofing, differs but little in its character from felt; and yet the latter only is untaxed.

It appears that the principal inequalities in the present mode of levying the paper duty are as follows:—

Jacquard loom cards, which when done with are still of some value, receive a drawback.

The paper used in making pots, which is destroyed, receives no drawback.

There is no duty charged on Florentine buttons made in the mill, and, of course, there is no duty on the waste.

A duty is charged on the button board to be made into buttons elsewhere, and there is no drawback upon the waste.

Gun waddings differ from Florentine buttons only in having white paper pasted over the brown board, but, unlike Florentine buttons, gun waddings pay no duty, and are smuggled among the buttons to the detriment of the fair trader who pays his duty.

Jacquard cards already pierced pay no customs duty. Jacquard cards not pierced pay customs duty of 2½d. per lb. Cards fit for boxes pay customs duty of 2½d. per lb.

Boxes ready made pay only ten per cent. *ad valorem*.

The following correspondence has taken place between the Lords Commissioners of Her Majesty's Treasury and Mr. J. Scott, a maker of envelopes:—

The humble Memorial of John Scott, of Charlotte-street, Blackfriars-road, Envelope-maker,

SHOWETH,—

That your Memorialist is a maker of envelopes, which he cuts from paper manufactured by another person; that in the process of cutting there is a considerable waste of paper; that this waste is of value only for the purpose of being re-made into paper, for which purpose your Memorialist sells it at £19 per ton; and that the duty on this sum, £14 14s., is a duty from which the envelope-maker who is also a mill-owner is exempt, as his paper is not

larged till it is made into envelopes, and the waste is returned to the mill without the payment of duty. That your Memorialist, feeling himself aggrieved by this unfair competition, appealed to the Board of Inland Revenue for redress, but without effect, as is set forth in the following correspondence.

NO. 1.—(TO THE BOARD.)

That your Memorialist is emboldened to ask for relief from this unfair pressure by a consideration of the following facts:—
1. That the makers of pasteboard, though legally chargeable with duty on the paste, and placed under the supervision of the Excise to be so charged, are allowed, for the most part, to escape payment of that duty.

2. That even in the mills, certain small articles, such as buttoned buttons, are exempted from duty, though no such exemption is laid down by the Act of Parliament.

3. That a drawback is given on the cards used in Jacquard looms, and that this too is a privilege not conferred by the Act. That it, therefore, appears that it is the practice to temper the severity of the Excise on paper by judicious exemptions.

That in none of the above instances is the exempted party suffering from so unfair a competition as that described by your Memorialist in his own case.

Your Memorialist, therefore, prays that your Honourable Board will grant him a drawback on the waste cut from his envelopes.

NO. 2.—(FROM THE BOARD.)

Jan. 21, 1857.

SIR.—The Board of Inland Revenue have now carefully considered the memorial you recently addressed to them, and they desire me to say that they see so much difficulty, as well as danger to the revenue, in the way of an extension of the indulgence to which you refer, to envelope-makers who are not paper-makers, that they cannot consent to give effect to your wishes in this respect.

NO. 3.—(TO THE BOARD.)

[EXTRACT.]

March 14th, 1857.

I confess I do not see the difficulty of making such arrangements as would prevent fraud on the revenue. I sell my waste to a paper-maker, and it would be very easy for me to arrange that I should deliver it in the presence of the supervisor, who might either give me an order for the drawback, or deduct the amount from the mill-owner's account, with whom I could make my arrangements.

With such a plan I do not see how the envelope-maker could succeed in the commission of a fraud,—may he would have much chance of doing so than the paper-makers themselves.

I therefore respectfully request you to have the kindness to reconsider my petition, and to take into consideration the suggestions I now make.

NO. 4.—(FROM THE BOARD.)

[EXTRACT.]

March 28th, 1857.

After a careful reconsideration of the whole subject, the Board are unable to satisfy themselves that the concession in question could be granted with safety to the revenue.

Your Memorialist, whilst acknowledging the courtesy of the Board, complains that their refusal is not accompanied by any specific reason. The principle of giving drawbacks not authorised by the Act of Parliament, having been once admitted, it becomes the duty of those who have the power to grant them, to examine every case presented to them, and not to refuse any claim which is founded on a grievance equal to any which has been previously redressed, unless it can be shown that such previously redressed grievance can be redressed with less danger of fraud on the revenue than would accrue from the entertainment of the subsequent claim.

Your Memorialist, therefore, prays that your Lordships will grant him a drawback on the waste of his envelopes, or, failing this, that you will call upon the Board of Inland Revenue to explain why such drawback would lead to a fraud on the revenue, so that your Memorialist may have the opportunity of stating to your Lordships the reasons why he thinks such a position untenable.

I have the honour to be, My Lords,

Your Lordships' obedient Servant,

JOHN SCOTT.

(The Treasury in reply.)

June 17th, 1857.

SIR,—With reference to your application, requesting that the drawback of the duty may be allowed on the waste cuttings of paper used by you in making envelopes, I am directed by the Lords Commissioners of Her Majesty's Treasury to inform you that the law has made no provision for a return of duty in such cases, and My Lords do not think it would be expedient to comply with your application.

I am to observe, with reference to the case of envelope-makers who are also mill-owners, that their envelopes are made from paper before the duty has been charged upon it, and under the supervision of the surveying officers of the Excise; no claim, therefore, arises with respect to the cuttings,—as they are re-manufactured without leaving the premises, the revenue is not exposed to risk.

I am, Sir, your obedient servant,

JAMES WILSON.

(To the Treasury.)

August 1st, 1857.

MY LORDS,—I beg to acknowledge the receipt of your letter, in reply to my memorial praying for—

A drawback on the waste of my envelopes
or, That the Board of Inland Revenue should be called on to show why they consider that my proposal would endanger the revenue.

In reply, you state,

1st. That the law makes no provision for the drawback which I request.

2nd. That the mill-made envelopes are cut before they are charged, and are, therefore, not liable to the duty on the waste.

3rd. That the revenue is not exposed to risk by this advantage possessed by the mill-owning envelope-maker.

The first two of these statements were made in my Memorial, and the third was implied in it.

I grounded my request on the fact that in other cases, which I specified, you had given a drawback for which no provision had been made by law.

The very grievance of which I complain, is the exemption of the mill-owner from a duty on the waste; no doubt the exemption is perfectly legal, but the right of manufacturing envelopes in the paper mills converts the tax which the Legislature intended to be on the raw material into one merely on the manufactured article, while the heavier tax remains upon the domestic envelope-maker.

Nor is there any limit by law to the amount of wholesale manufacture which may thus be carried on with a differential duty in its favour. A wholesale publisher may print and bind his books at the mill without any compensating inconvenience, except that he must pay duty on the ink, paste, and string employed in printing and binding. It is true that, as yet, you put hindrances in the way of such an establishment; but I cannot find in the Paper Duty Act any restriction other than that which I have named.

You say that by the privilege thus enjoyed the revenue is not exposed to risk. No one could suppose that the paper sent out will not pay duty; I submit, however, that if the revenue be really entitled to a duty on the waste, it is exposed, not to risk, but to positive loss when that duty is not paid,—and that, if the revenue be not entitled to this duty in the case of a mill-owner, it is an act of spoliation to take it from me.

I have already pointed out that your Lordships do not consider yourselves prevented from granting a drawback by the absence of any legal provision for such drawback, and I submit that the only conclusive reason for denying my request would be a well-grounded fear of fraud.

I have submitted a plan, which, as it appears to me, would obviate any attempt at fraud, and my request was, that if you did not at once concede the drawback in my case, you would call on the Board of Inland Revenue to

explain their reasons for thinking it necessary to deny it, I submit that the injustice of the present state of things is so clear, that the necessity for such injustice ought to be made equally clear. This part of my request you have ignored. I therefore again call your attention to it, and submit that if you persist in refusing to grant this portion of my prayer, it will appear that the reason for denying my second request is the justice of the first.

I have, &c.,
JOHN SCOTT.

(From the Treasury.)

October 12, 1857.

SIR,—I am directed by the Lords Commissioners of Her Majesty's Treasury to inform you that, since the receipt of your further application of the 1st of August, My Lords have been in communication with the Board of Inland Revenue, for the purpose of seeing whether regulations might not be framed under which the concession for which you apply might be made without serious risk to the revenue; and My Lords have given authority to the Board of Inland Revenue to pay drawback of duty charged on waste cuttings of paper made into envelopes, on proof, to the satisfaction of the commissioners, that the cuttings have been reduced to pulp at a paper-mill, or otherwise destroyed.

I am, Sir, your obedient Servant,

W. TREVELYAN.

Mr. J. Scott, 39, Charlotte-street, Blackfriars.

The following has since been issued:—

GENERAL ORDER.

Inland Revenue Office, Somerset-house, London,
October 20th, 1857.

In pursuance of directives from the Lords Commissioners of Her Majesty's Treasury, dated the 13th inst.: Ordered.—

That drawback of the duty, charged on the waste cuttings of paper made into envelopes, be allowed under the following regulations, viz.—

The paper from which the envelopes were made, must not have been previously used or prepared for any other purpose.

On notice in writing being given by the envelope-maker to the proper officer, the latter must attend at the premises of the former, and examine the cuttings (observing that they are really those from envelopes, which may be known by their curved and angular form) and see them packed in bags and weighed. He must enter the particulars in a Scheme in his Beer Book, showing the gross weight and the tare of each bag, and the net weight entitled to drawback.

The cuttings must be sent to a paper-mill where paper is not cut into forms for envelopes, and must be there reduced to pulp or otherwise destroyed; and the officer must forward to the officer at such mill, an advice letter containing an account of the gross weight, the tare, and the net weight of each bag.

On the arrival of the cuttings at the mill, the paper-maker must give the officer thereof forty-eight hours' notice in writing, in order that he may attend to weigh and examine the cuttings; and, if they agree with the particulars of advice, he must see them put into a beating machine, boiler, or other vessel, and saturated with water, whereupon grant a certificate in duplicate that the cuttings have been received, which certificates must be countersigned by his supervisor, who will forward one of them to the officer of the station, and the other to the collector of the collection, from which the cuttings were received.

On such certificate being received by the officer, he must compare it with the particulars entered in his book, and if they agree, he must sign a declaration before him in the following words:—
“I, the undersigned, do hereby declare that the cuttings of paper made into envelopes, which are the subject of the above certificate, have been received by me, and that they have been reduced to pulp, or otherwise destroyed, in accordance with the regulations in that behalf made, and that the drawback thereon may be had on

Supervisors must embrace every opportunity of weighing envelope-cuttings before and after their removal.

If any envelope-maker shall infringe these regulations to the prejudice of the revenue, this indulgence will be withdrawn from him.

By the Board,
THOMAS DOBSON.

SOUTH KENSINGTON MUSEUM.

During the week ending 14th November, 1857, 6 visitors have been as follows:—On Monday, Tuesday and Saturday (free days), 2,403; on Monday and Tuesday (free evenings), 3,852. On the three students' day (admission to the public 6d.), 500. One students' evening, Wednesday, 134. Total, 6,889.

Home Correspondence.

LECTURES AT MECHANICS' INSTITUTES.

SIR,—At the distribution of prizes of the East Lancashire Institutional Union a short time since, the late Bishop of Manchester, who presided on the occasion, reported to have said:—“As the vain, feeble, and unsatisfactory support of lectures was rapidly giving way. This re-echoes a statement in the Annual Report of the Lancashire and Cheshire Association of Mechanics' Institutes, that in the large towns of the Northern and Midland Counties lectures were a complete failure. As agent and lecturer of the Yorkshire Union, comprising 190 Mechanics' Institutes, I delivered no fewer than 113 lectures during the last winter season, and may, therefore, be presumed to have some experience on this subject. I certainly cannot speak of the success, or want of success, in giving the statement I have referred to the most direct contradiction. So far from being a failure, lectures are better appreciated than ever they were. In the majority of instances I have met with very good attendance, and, what is more satisfactory, attentive listeners of all classes, while I have endeavoured to convey information chiefly of a scientific character, in popular language made clear by homely illustrations, and I have reason to believe that they have had a good effect upon the members of many of the Yorkshire Institutes.

At the soirée of the Leeds Mechanics' Institute, Mr. Brougham made some excellent observations on the value of lectures, although his lordship appeared to me to give undue preference to a continuous course over what he facetiously styled sporadic lectures. This may be very true if the hearers constituted a class for the study of some particular department of science or literature, but for a Mechanics' Institute such a course is simply impossible. For a miscellaneous audience, composed of persons varying in sex, age, condition, habits, and inclination, I find the most successful lecture to be one which applies scientific knowledge to the affairs of every-day life, which incites to study by pointing out the advantages to be gained by it, which is rather suggestive than instructive, and the tendency of which is to stimulate application in the classes and recourse to the library. In this light, lectures are the most valuable and important adjunct to the operations of a Mechanics' Institute, and they have this further advantage, that they are often the only means of making the existence of the Institute known to the inhabitants of the locality.

It is sometimes a matter of complaint that lectures

of pecuniarily successful owing to members being admitted free. Allow me to suggest to managing committees that this difficulty might be, in a great measure, obviated by canvassing the inhabitants generally to take tickets for a course of lectures, varying, of course, in number according to circumstances. They would then be enabled to make arrangements accordingly. In several instances such a plan has been pursued with great success.

I am, &c.

BARNETT BLAKE.

Mechanics' Institute, Leeds.

Proceedings of Institutions.

HERTFORD.—The twenty-sixth annual report of the proceedings of the Literary and Scientific Institution states that, although there appears a balance against the institution in the treasurer's account, yet the successful working of the Society since the last report, affords the committee great satisfaction. There are two or three items of expenditure which the committee have felt it necessary to incur, which have caused the unusual reduction of the Society's funds. The committee have to record their deep regret at the loss which the Institution sustained in the death of their late president, Earl Cowper. The vacant office was offered to, and accepted by the Marquess Townshend. The question of reviving the discussions during the winter months was brought under the consideration of the committee; but it was thought desirable to try the experiment of holding in lieu hereof monthly conversaciones, at which papers upon various branches of Science and Art, and other subjects of general interest, should be read and conversed upon; and these meetings have proved completely successful. The committee believe that, by continuing these at a future time, they will be promoting one of the best objects of the Institution, namely, the discussion of many subjects of an interesting and instructive character, to the gratification and advantage of those who take part in them, and they recommend that these important auxiliaries to the usefulness of the Society be renewed during the winter months.

RICHMOND.—In the last report of the Parochial Library and Reading-room, the Committee state that this Institution has during the past year progressed satisfactorily in forwarding the objects for which it was founded. Some additional papers have been added to the reading-room, and it has maintained its last year's average of attendance. A new bookcase has been placed in the library, filling up one entire side of the room; and twelve pounds have been most judiciously expended for the Society, by Mr. Bohn, in the purchase of standard works; this, in addition to the handsome donation of ten pounds worth of his own publications, and a large number of volumes presented by J. C. Selwyn, Esq., Q.C., and the executors of the late H. Leatham, Esq., have considerably augmented its interest and usefulness. In addition to which, a large balance from the proceeds of the bazaar remains still to be expended. Upwards of three thousand five hundred volumes have been taken out for perusal during the year. The lectures have continued to maintain, if not to enhance their high character. There have been thirteen during the year, all well attended. The conversational lectures have much improved, both in intrinsic interest and popularity. Of these, there have been eleven, all given (with one exception) by members of the Society. The classes have been: a Hullah Singing Class; Drawing Class; Bible Class; and a Writing Class, which have all been fairly successful. The Committee desire to draw attention to the fact that the one and only candidate from this Society, Mr. Callan, who has presented himself for the examinations recently held by the Society of Arts, in London, has obtained from that body a certificate of proficiency in the subjects which he took

up. The Committee hope that next year many may be stimulated to follow his example, and assure all members that no effort of theirs shall be wanting to assist, by classes or any other means, the praise-worthy objects which these examinations are designed to carry out. The following are the arrangements for lectures up to Christmas next:—Oct. 20. Concert, by the Hullah Class, director, Mr. Evans. Oct. 29. Lecture, J. Anderson, Esq., "The Evidence of Design in the Animal Creation," with Microscopic Illustrations. Nov. 3. Conversational Lecture, Mr. Holmes, "The Trees and Shrubs of Great Britain," indigenous and naturalised. Nov. 10. Lecture, Rev. J. W. Watson, M.A., "Labour." Nov. 17. Conversational Lecture, Mr. Pugh, "Money: its History and Philosophy, Uses and Abuses." Nov. 24. Lecture, J. H. Stocqueler, Esq., "India." Dec. 1. Conversational Lecture, T. B. Anderson, Esq., "Materials for the Study of Natural Philosophy." (Continued.) Dec. 8. Lecture, S. D. Bird, Esq., "Dreams and Sleep-walking." Dec. 15. Conversational Lecture, Mr. Darnill, "An Evening with Wilkie," illustrated with several engravings from his pictures. The Hullah class commenced a fresh course of lessons on Nov. 2nd. A drawing class, under the superintendence of a master from the Department of Science and Art, at Marlborough-house, will be established as soon as a sufficient number of names are received to warrant the undertaking. Twenty pounds' worth of new standard works have lately been added to the library.

MEETINGS FOR THE ENSUING WEEK.

- MON.** Geographical, 84. I. Progress of the British North American Exploring Expedition under Mr. Palliser, F.R.G.S. II. Reports from the Expedition to East Africa under Capt. R. Burton and J. H. Speke, F.R.G.S.
- TUES.** Civil Engineers, 8. Discussion on Mr. Molesworth's Paper "On the Conversion of Wood by Machinery." Med. and Chirurg., 84. Zoological, 9.
- WED.** Society of Arts, 8. Dr. Forbes Watson, "On the Composition and Relative Value of the Food Grains of India."
- THURS.** Antiquaries, 8. Royal, 84.
- SAT.** Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, November 13.]

Dated 2nd September, 1857.

2300. Thomas Hirdcastle, Bradshaw, near Bolton-le-Moors—Improvements in machinery for washing textile fabrics and fibrous substances.

Dated 15th September, 1857.

2392. Thomas Archer, jun., Dunston, Gateshead—Improvements in machinery for cutting off and heading lengths of metal, applicable to the manufacture of rivets and other articles.

Dated 21st September, 1857.

2448. Elizabeth Burton West, Keel-terrace, Regent's-park—Improvements in the manner of preparing and applying materials used in brewing to that purpose, and in the various processes and apparatus used in connection with the same, and for a novel apparatus connected with the same. (A communication.)

Dated 6th October, 1857.

2555. Edward Cavendy, New York—An instrument for taking zenith observations at sea (when the horizon is obscured) of any planet.

Dated 10th October, 1857.

2598. George Frederic Lombard, Paris—Improvements in steam engines.

Dated 19th October, 1857.

2664. Luigi de Cristoforis, 67, Lower Thames-street—An improvement on the system of vehicle wheels, to be called the "De Cristoforis Conical Wheels."

2670. Benedict Bernard and Alfred Rosenthal, Cheap-side—A new ornamental fringe or fringed fabric, also the means of producing the same.

2672. Henry Wimbald, Aldermaston, Berkshire—Improvements in machinery or apparatus for the manufacture of bricks, tiles, pipes, and other articles of a similar nature.

2674. William Edward Newton, 66, Chancery-lane—Improvements in the manufacture of drawing rollers. (A communication.)

Dated 30th October, 1857.

2678. Marc Antoine François Menou, 29, Rue de l'Abbaye-Montmartre, Département de la Seine, France—An improved hydraulic press.

2698. Robert Atkinson and Thomas Brearey, Baldon, near Brad-
ford, Yorkshire—Improvements in loom pickers.
2692. Francis Windhausen, Duderstadt, Hanover—Improvements in
increasing the adhesion of the wheels of locomotive engines
to rails when moist.
Dated 21st October, 1857.
2694. Alfred Vincent Newton, 64, Chancery-lane—Improvements in
the construction of sewing machines, and in the mode of
operating such machinery. (A communication.)
Dated 22nd October, 1857.
2696. Charles Reeves, Birmingham—Improvements in repeating or
revolving fire arms.
2697. James Hinks, Birmingham—An improvement or improvements
in stiffeners for wearing apparel.
2698. John Milne, Royton, Lancashire—Certain improvements in
carding engines.
2694. David Hogg Saunders, Craig Mill Cottage, Rattray, Perth—
Improvements in the preparation and manufacture of textile
fabrics and materials.
Dated 23rd October, 1857.
2700. Thomas Rand and George Beckley, Oxford-street—An im-
provement in saddle-trees.
2702. Alexander Theophilus Blakely, Tunbridge Wells—Improve-
ments in laying submarine telegraphic cables.
Dated 24th October, 1857.
2706. Alfred Vincent Newton, 64, Chancery-lane—An improvement
in the process of making wrought-iron beams or girders. (A
communication.)
Dated 24th October, 1857.
2711. James Fairclough, John Fairclough, and Joseph Cowan, Liv-
erpool—Improvements for suspending and working window
hangings and other drapery curtains.
2713. Charles de Clippelle, Brussels—Improvements in the manufac-
ture of boots and shoes, harness, and driving straps, which
improvements are applicable to uniting various materials
together, and also for waterproofing.
2715. Rev. John Walter Lee, Chelmsford—Improvements in com-
municating between the different parts of railway trains.
2717. Aaron Marks, 119, London-wall—An improved fastening for
gloves and other articles.
Dated 27th October, 1857.
2719. Charles Cadby, Lliquorpoed-street—Improvements in piano-
fortes.
2721. James Newall, Bury—Improvements in railway breaks and
signals, and in the machinery or apparatus for working the
same.
2723. Marc Antoine François Mcnnoos, 39, Rue de l'Echiquier, Paris
—An improved varnish. (A communication.)
Dated 25th October, 1857.
2726. William Irlam, Gibraltar Works, Newton Heath, near Man-
chester—Improvements in wrought iron railway chairs,
sleepers, and crossings.
2727. John Addison, Tours, France—Discovering and destroying hy-
drogen or carburetted hydrogen gas and other gases in coal
mines, dwelling houses, and other places.
2729. William Smith, 10, Salisbury-street, Adelphi—Improvements
in couplings or connections for shafts. (A communication.)
2731. Abel West, Wormley Ring, Huddesdon, Hertfordshire—Im-
provements in the manufacture of candles.
2733. George Shillibeer, 1, Commercial-place, City-road, and George
Giles, 10, Gray's-inn-square—Improvements in omnibuses.
2735. William Clark, 53, Chancery-lane—An improvement in rails
for railways. (A communication.)
2737. William Clark, 53, Chancery-lane—Certain improvements in
machinery for carding cotton, wool, and other fibrous sub-
stances. (A communication.)
2739. Elizabeth McDowall, Johnstone, Renfrew, N.B.—Improve-
ments in steam hammers. (A communication.)
2741. Henry Taylor, Staley-bridge, Lancashire—An improvement in
the "cans" employed in connection with machinery for pre-
paring cotton and other fibrous materials for spinning.
2743. Robert Alexander Ronald, Paisley—Improvements in the
manufacture of shawls.
Dated 29th October, 1857.
2745. William Delf, jun., Great Bentley, Essex—Improvements in
ploughs.
2747. Pietro Felio, 97, Holborn-hill—The improvement of an illumi-
nating reflector of light from gas, oil, or candle.
2749. David Allison and John Livingston, Manchester—Improve-
ments in machinery or apparatus for regulating the weight
or pressure to top rollers used in spinning or preparing fibrous
materials to be spun.
2751. Jonas Craven, Bradford, Yorkshire—Improvements in machi-
nery or apparatus used in weaving.
2753. George William Robinson, Barton-on-Humber—Improvements
in clod-crushing rollers.
Dated 30th October, 1857.
2755. Joseph Boyce Fraser, Kenilworth—An improvement or im-
provements in lubricating shafts, axles, screws, and other
articles requiring lubrication.
2757. William Clark, 53, Chancery-lane—Improvements in taci
blocks. (A communication.)
2759. William Harwood, Mendlesham, Suffolk—Improvements
reaping machines.
2761. John Lawson, Leeds—Improvements in machinery for rovi
flax and other fibrous substances. (Partly a communication.)
2763. Samuel Knowles, Tottington Mill, near Bury—Improvements
in "dyeing" fabrics preparatory to dyeing.
Dated 31st October, 1857.
2765. George Bell Galloway, 42, Basinghall-street—Improvements
in the construction of merchant ships and other vessels,
motive power, propulsion and boiler furnaces.
2767. James Owen, Worsley, Lancashire—Improvements in machi-
nery or apparatus for the prevention of accidents, applica-
ble to hoisting and other lifting machines.
2769. Richard Martin, Ebenezer Hall, and Joshua Hall, Shrewsbury
Works, Shrewsbury—Improvements in steam hammers.
2771. Richard Archibald Broomas, 164, Fleet-street—Improvements
in the construction of boats. (A communication.)
2772. Johann Julius Schenckel, Breslau, Prussia, and Peter Jeli
Thouret, Berlin—The manufacture of a composition which
will render inflammable materials incombustible.
2773. William Woodhead, James Woodhead, and John Woodhead
Eccleshill, near Leeds—Improvements in the manufac-
ture of kiln tiles, and in the machinery or apparatus employ-
ed therein.
2775. Prodromos B. Kyalogloo, Constantinople—Improvements in
obtaining and applying motive power.
2777. George Hallen Cottam and Henry Richard Cottam, St. Pa-
cras Iron Works, Old St. Pancras-road—Improvements in
stable fittings.
Dated 2nd November, 1857.
2779. Robert Kirkman, St. Helen's, Lancashire—Improvements in
the fuses of lever and other watches.
2781. Eugene Murray, Beresford-street, Woolwich—Preventing ac-
cidents on railways.
2783. Charles Iles, Birmingham—Improvements in wardrobes &
similar receptacles for articles of dress, and in stands, frames
and pins for holding or suspending articles of dress.
2785. James Apperly and William Clissold, Dudbridge, Gloucestershire—
Improvements applicable to carding and condensing
engines.
Dated 3rd November, 1857.
2789. James Edward Boyd, Hither-green, Lewisham—Improvements
in skates.
2791. David Harcourt, Losells, Birmingham—Improvements in
wrenches.
2793. Rudolph Wappenstein, Manchester—Improvements in docu-
ment or scrapers used for cleaning engraved surfaces.
2795. William Edward Newton, 64, Chancery-lane—Improved ma-
chinery for cutting files. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

November 13th.		1400. Charles Frédéric Vassart
1359. William Sissons and Peter White.		1406. Julius Friedrich Philip Ludwig Von Sparre.
1367. Daniel Reading.		1412. Charles Weightman Harrison.
1369. Charles Bartholomew and John Hepinstall.		1419. George Sharp and William Elder.
1370. Joseph Atzlewood.		1421. Elijah Aldis.
1378. Edward Gripper.		1422. John Harrison.
1383. Francis Parker.		1450. Samuel Fox.
1386. Henry Jones.		1490. William Holland.
1393. James Apperly and William Clissold.		1506. Thomas Grahame.
1403. Charles Reeves.		1807. Thomas Taylorson Joplin.
1495. Edward Welch.		1808. Edward Paige Griffiths.
1513. Thomas Hart.		1830. James Merryloes.
1517. Thos. Willis and G. Chall.		1798. William Crook, Gilbert Rushton, & Joseph Crowther.
1541. John Aiken Salmon.		1961. Thomas Modell Smith.
1607. John Robertson.		2018. Henry Doulton.
1697. Henry Brinsmead.		2063. William Hirst.
2349. Peter Armand le Comte de Fontaine-morau.		2158. George Collier, William Noble, & Ward Holroyd.
2349. Leon Louis Honoré Berton.		2391. Gerd Jacob Bensen.
November 17th.		
1394. Rudolph Bolmer.		

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

November 10th.		2423. James Buchanan.
2399. Peter Armand le Comte de Fontaine-morau.		November 13th.
2502. John Clarke.		2402. Joseph Armstrong.
November 11th.		2426. Robert Wilson.
2420. Samuel Henton.		November 14th.
November 12th.		2425. Peter Knowles and Edward Kirby.
2408. Lancelot Kirkup.		2432. William Hann.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
1353	Nov. 10.	The Fuel Economiser or Cinder Save-all	John Henry Hodd	29, Hill-street, Peckham, Surrey.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 27, 1857.

NOTICE TO MEMBERS.

The Council hereby convene a Special General Meeting of the Members of this Society, to be held on Tuesday, the 1st of December, at 7 o'clock, p.m., for the following purposes:—

1. To revoke the five existing Bye-laws which relate to the Board of Examiners, and to make and adopt other Bye-laws in the place thereof.

2. To consider the amended and extended scheme of Examinations which the Council propose to carry out in concert with the Institutions in union.

3. In compliance with a requisition received from certain members, "to take into consideration and decide on the propriety of continuing to hold Local Examinations of the Members of Mechanics' Institutions and similar societies, and to award certificates of merit accordingly."

4. And, generally, to pass such resolutions as may express the sense of the meeting in relation to all or any of the before-mentioned subjects.

By order of the Council,

P. LE NEVE FOSTER, Secretary.

Society's House, Adelphi, London, Nov. 23, 1857.

EXAMINATIONS FOR 1858.*

NOTICE TO THE INSTITUTES.

1. In 1856 the Society's Examinations were held in London alone. In 1857 they were held in London and Huddersfield.

2. In 1858, and thenceforward, it is proposed to hold them simultaneously at all places, throughout the whole extent of the Union, where suitable arrangements can be made by the authorities of the Institutes.

3. The Society of Arts cannot satisfactorily hold oral examinations, simultaneously, in many places. The Society's Examinations, therefore, will in future be wholly by papers.

4. The Council invite the Institutions in union to assume in future a larger share of authority and responsibility in the management of the Examinations.

5. Bearing in mind that the Union of Institutions was formed for the purpose, not of superseding, but of promoting and supplementing, the action and self-government of those bodies, the Council propose the following scheme of

Previous } Examinations by the { Local Authorities.
Final } Society of Arts.

* The Programme with the subjects of Examination may now be had of Messrs. Bell and Dalby, 186, Fleet-street, publishers to the Society of Arts.

PREVIOUS EXAMINATION BY LOCAL BOARDS.

6. The Institutes in different parts of the Union are invited to appoint Local Boards, who will conduct the previous Examinations of their own Candidates, and also supervise the working of the papers which the Society's Board will set for the Society's Final Examinations.

7. No Candidate can be admitted to the Final Examinations without a Certificate from his Local Board, that he has satisfactorily "passed" its previous Examination (a) in the elementary subjects specified in par. 10, 11, 12, 13, and (b) in the special subjects in which he wishes to be examined by the Society's Board.

8. The previous Examinations must be held twelve weeks before Whitsuntide.

9. Unreserved communications between the Society and the Local Boards will be requisite to secure to the "passes" of the various Local Boards throughout the Union such an uniformity of value as may be attainable; and it is hoped that their standard may be raised, carefully and gradually, from year to year, in order that the scope and authority of those bodies may be constantly on the increase.

10. The previous Examinations of the Local Boards will test the handwriting and spelling of the Candidates, their knowledge of English grammar, composition, and the common rules of arithmetic, as well as their knowledge of those special subjects in which they seek to be examined by the Society's Board of Examiners.

11. HANDWRITING.—A bold even round-hand, without loops, longtails, or flourishes, should be preferred.

12. ENGLISH GRAMMAR AND COMPOSITION.—An extract from some standard English author may be set, into which errors of spelling, grammar, and punctuation are introduced. Some faulty grammatical constructions in common use, and vulgarisms, may be submitted for correction.

13. ARITHMETIC.—A knowledge of the elementary Rules, including the Rule of Three, should be required.

FINAL EXAMINATION BY THE SOCIETY'S BOARD OF EXAMINERS.

14. The names of the "passed" candidates, and the subjects in which the Society is to examine them, must be made known to the Council eight weeks before Whitsuntide.*

15. The Society's Examiners will then set the papers for the final Examination; and these will be forwarded to Local Boards. The Local Boards will see, and certify to the Council, that the papers are fairly worked, by each Candidate, without copying from any other, and without

* The required number of forms for this purpose will be forwarded to the Local Board on application to the Secretary of the Society of Arts.

books or other assistance; and will return the worked papers to the Council.

16. No person who shall not have been, for six months previously, a member of an Institution in union with this Society; no person under sixteen years of age; no graduate or undergraduate of any university of the United Kingdom; no student of any of the learned professions; no certificated schoolmaster or pupil-teacher; and no person who has not satisfactorily "passed" the previous Examination of the Local Board, is eligible for examination by the Society's Examiners.

17. No Candidate will be examined in more than three subjects.

18. The Examinations will be conducted by printed papers. Every paper will, in general, be divided into two sections; an easier, and a more difficult one. Satisfactory answering in the former will entitle a Candidate to a Certificate of Competency. The Examiners will award Certificates of three grades, but Certificates of the first grade will be awarded only to a high degree of excellence.

19. The Final Examinations of the Society of Arts will be held on Whit Monday, the 24th of May, 1858, and on such successive days as may be requisite, simultaneously at such places, throughout the Union, as can make satisfactory arrangements for the previous Examinations of the Local Boards, and for the supervision of the working of the papers in the final Examinations of the Society's Board.

20. Judgment will then be passed by the Society's Board of Examiners, and the Awards, Prizes, and Certificates will be communicated to the parties concerned.

21. The Prizes and first-class Certificates will be awarded at some local centre of importance. The Council will afford some aid to the travelling expenses of the candidates who may desire to come up and receive their Certificates.

ASSOCIATES IN ARTS OF OXFORD AND CAMBRIDGE.

22. The Council have read with the greatest satisfaction the Statute, recently published by the University of Oxford, for examining and granting the title of "*Associate in Arts of Oxford*" to young persons not in the University. Cambridge is happily following this excellent example.

The Examinations are to be annual, independent of any denominational test, and open to all youths under 18 years of age.

With the view of assisting to bring the proposed titles of "*Associate in Arts of Oxford*," and "*Associate in Arts of Cambridge*," within the reach of the members of Institutes in union with this Society, the Council will grant to each not less than 16 or more than 18 years of age who shall obtain, in 1858, three of the So-

ciety's Certificates of the first class in the subjects contained in the Oxford and Cambridge programmes, the sum of £5 towards his expenses, if he attends at the University and undergoes the Examination there.

By order of the Council of the Society of Arts.

P. LE NEVE FOSTER, *Secretary*.

Nov. 23, 1857.

SECOND ORDINARY MEETING.

WEDNESDAY, NOV. 25, 1857.

The Second Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 25th inst., Dr. Lyon Playfair, C.B., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Burley, Benjamin	White, William Foster,
Haywood, Fred. Michael	F.R.G.S., F.G.S., &c.

The Paper read was:—

ON THE COMPOSITION AND RELATIVE VALUE OF THE FOOD GRAINS OF INDIA.

By J. FORBES WATSON, A.M., M.D., BOMBAY ARMY.

Before proceeding to consider the composition and relative value of the more important of the food grains of India, a few preliminary remarks will be necessary; and, first, I have to state that the researches on which the following observations are chiefly founded, have been conducted under orders received from the Court of Directors of the East India Company, with the object of illustrating the nutritive value of the principal divisions of the food resources of our Indian Empire.

The details, chiefly chemical, connected with this investigation will be fully discussed elsewhere, and, therefore, in the meantime, I confine myself to those points which, from their dietetic and commercial relations, seem of chief interest.

Viewed with reference to sound social and political conditions, the quality and amount of the vegetable food substances which a given country furnishes, or can furnish, is pre-eminently of vital importance, and to a country more so than to India, in which the vast bulk of the means of subsistence of 176,000,000 of inhabitants is directly gathered from the soil. Every country has its vegetable products, differing much in value as nutritive quality; and to improve the state of agriculture to increase the productive powers of the soil, and to bring the food grains of the rich within reach of the poor man's purse, is, in other terms, to increase human happiness to advance civilization, and to plant deep the roots of sound national wealth. As Dr. Royle has forcibly pointed out, the slightest enlargement in the size of grain, or the least increase in the productiveness of an acre of corn, when extended into the agriculture of a country will infinitely increase its resources and revenues. The advancement of agriculture is, for every reason, then, the interest of the state, and in addition to the welfare of its people, and the condition of its finances, the question has other deep connections. England has had her troubles, and France is not the only empire in the world whose political existence of the hour has been upon her heads of corn.

So far, then, with reference to the importance of agriculture to the state, and to the direct relations of the cultivator to the soil.

Experience has, to a certain extent, taught man the relative nutritive power of the food products around him. Market value, indeed, usually stamps this. Still the researches into this subject during the last 10 or 15 years, which have shed a broad light on many points formerly obscure, can be brought to bear in the most important way on many questions which affect the interests of the people and of Government. The productions of India are as numerous as its surface is diversified and its climate various, and a glance at these tables will show that its food grains in point of number alone occupy no unimportant position. These, with a few exceptions, are cultivated (in, however, very varied quantities) throughout the whole of India, and form the staple food of the mass of the population. In the plains of Upper India, to the west, in Guzerat and Scinde, wheat is extensively cultivated, and in the north, along with barley, constitutes the common food of the people, whereas in the south, wheat for the most part is a luxury which the poor man cannot reach. Thus, also, rice at the deltas, and by the sides of large rivers, is the chief food of the million, but pass inland some distance, and it in its turn has become available only to the rich.

Here the poor man sighs for the "Chowl" (rice) of the river level, and looks with less favour on his staple millet, which experience in some places has, however, shown, and science in these tables demonstrates, to be in some respects superior to rice; and thus in given cases chemistry may confirm experience, and settle certain conclusions on a firmer basis.

A mixed diet has been declared essential for man, and this, the grain-fed inhabitant of the East, carries into practice in a sense as strict as when we add flesh to bread and vegetables. The food grains of India present the usual grand divisions into cereals and pulses, and under these heads are arranged the various classes of grains used as food for man and beast. First, then, on the list of cereals stands wheat, which, *par excellence*, may be considered the grain in which almost the requisite balance exists between the nitrogenous or flesh-forming constituents, and the non-nitrogenous or heat-yielding and fat-forming elements, and, indeed, wheat-flour may be taken as the standard by which to compare the relations between the nutritive components of other grains. Bread will, under ordinary conditions, support the system for a longer period than any other compound, and it is possible that, were man less a "cooking animal," it would do so under conditions demanding more than ordinary muscular exercise. Bread and water does, however, present but little variety to the palate, and it is well known that with, as far as we at present know, the plastic and carbonaceous elements in proper proportion, the human system demands change, and that *ameness* alone will in time produce that somewhat enigmatical disease, scurvy. The relations between the nitrogenous and non-nitrogenous constituents of our Indian and English wheats, as seen in the Table No. 3, is as 8.6 of the latter to one of the former, and, allowing a proportion for the extra quantity of nitrogen which the bran of the whole meal contains, about 6.6 may be taken as the relation which exists between these important constituents in wheat flour; that is to say, that a compound consisting of from six to six and a-half pounds of non-nitrogenous to one of nitrogenous matter, contains these in the proportions required by the human body under ordinary conditions. Suppose, then, that six non-nitrogenous to one nitrogenous represent the proportions in which the system demands these elements to exist, and we have at once a standard by which to measure the nutritive value of other grains, and a reference to the table will show that almost all the others on the list either fall considerably short of, or go beyond, the point thus fixed. Take rice, for instance, and let us illustrate this as well as some other points of interest. In rice it will be observed that the proportion of carbonaceous matter, such as fat and starch, to albuminous compound, is, in some cases, twice as much as it is in wheat, and that on

the average it amounts to ten and a-half of the former to one of the latter, instead of six, which we have assumed to be about the proper amount. The native of India would consequently have to eat twice as much of rice as he would of flour in order to obtain the requisite amount of nourishment, and to supply the never-ceasing wear that is constantly going on in the human body.

The popular notion is that rice forms the entire bulk of the diet of almost all the inhabitants of the East, and those, even on the spot, who, with vision unopposed by superfluous clothing, have seen a thin lanky Cooly sit down to his evening meal, and have watched the gradual development that has attended his operations, might feel disposed to coincide in this, but, nevertheless, it is not a fact that the native of India lives on rice. Rice, when he can afford it, certainly does form the bulk of his food, but, as a rule, viewing the population as a whole, it is the food of the rich. The stomach of the poor ryot, large as it is, could not with impunity take in and digest the quantity of rice which would be required to supply the sanguigenous or blood-forming wants of his system, and accordingly nature's promptings have led him to add one or other of the numerous pulses shown in Table 2, in quantity sufficient to supply to the starchy rice the requisite amount of nitrogen, containing, as many of them do, nearly twice as much of that essential element as wheat.

There are, of course, other articles of diet, non-vegetal, which, according to caste, that incubus of India, various classes are permitted to employ, such as eggs, fish, and flesh of certain animals, &c., which must be considered in order to afford a comprehensive view of dietetics in India; but for the present I must confine my observations strictly to the relative nutritive value of these grains, two or more of which conjoined constitute the entire bulk of the solid food eaten by the Brahminical or strict vegetable-eating class.

We see, then, from the fact just mentioned, that experience has taught the native of India to combine these grains, so as to secure a true mixed food in the nutritive sense of the word. As a rule, to his rice he adds from one-fourth to a fifth of some leguminous seed, his favourite one being the *Cajanus indicus*, of which some analyses stand out in Table 2.

These pulses accordingly occupy a most important position in the food catalogue of the country; they are, in fact, to the Brahmin what beef and other fleshies are to us, and their importance now and then receives a sad illustration when their failure as a crop obliges the ryot to have recourse entirely to rice or some of the less nutritious millets.

On the existence, then, of these pulses, or on a supply of animal food, depends, with few exceptions—of which wheat, barley, and oats constitute the chief and almost only ones—the relation which ought to exist between the blood and flesh-forming and heat or fat-yielding elements in a given diet.

A detailed statement of the special results which these tables indicate will be presently given, but before proceeding to do so, a few other remarks on nutritive value will not be out of place, and in making these I may, perhaps, be excused if I repeat one or two things already cursorily touched upon.

At the head, then, of the list of cereals stands wheat, which, as already mentioned, is held, in itself, to contain, in proper proportion, all the elements necessary for the support of animal life, which in the form of bread or cooked flour, at the same time, probably, also affords the bulk which is requisite to the constitution of a suitable diet, and, for this reason, it can be taken for a longer period than fat flesh, which, in a concentrated form, also contains the essential elements in proper proportion.

Experiments, then, with bread have shown that, under ordinary conditions, it will support the system for a period so long that it may be fairly argued that, whei

FOOD GRAINS OF INDIA.

TABLE I.—CEREALS.
COMPOSITION PER 100 LBS. IN NATURAL OR FRESH STATE.

DESCRIPTION.				COMPOSITION.										REMARKS.
NAMES.		Date and Place of Growth, or Market whence obtained.	ORGANIC.					MINERAL.						
Common.	Botanical.		Moisture.	Nitrogenous Matter, Gluten, Albumen, &c.	Fatty Matter.	Starchy Matter.	Total Non-nitrogenous Matter.	Proportion of Non-nitro- genous to Nitrogenous.	Phosphorus.	Sulphur.	Total Mineral Matter (Ash).			
WHEAT.														
1	Wheat, Gehoow Kunak.....	Triticum vulgare, &c.	Broach Zilla, 1854	12.40	15.62	1.16	68.74	69.80	4.47	.365	.068	1.98	Employed solely as mas, and eaten by richer d	
2	"	"	Bombay Bazaar, 1856.....	12.80	13.16	1.06	71.73	72.78	5.83	.371	.067	1.76		
3	"	"	Guzerat, 1857	13.81	13.05	1.36	70.14	71.50	5.47	.373	.064	1.64		
4	"	"	Bombay, 1857	13.41	12.84	1.17	70.99	72.16	5.52	.331	.057	1.59		
5	"	"	Guzerat, 1855-6	10.90	13.23	1.29	73.28	74.57	5.63	—	—	1.30		
6	"	"	Bombay Bazaar, 1857....	13.32	14.60	1.14	68.64	69.76	4.71	—	—	2.10		
7	"	"	Madras, 1856	10.80	12.72	1.03	73.77	74.80	5.79	—	—	1.65		
8	"	"	Calcutta, 1856	11.78	11.34	1.01	73.97	74.98	6.67	—	—	1.90		
Mean				12.40	13.34	1.15	71.41	72.56	5.60	.362	.062	1.68		
BARLEY (WITHOUT HUSK).														
9	Barley, Gow.....	Hordeum hexastichon	Bombay Bazaar, 1857...	12.56	14.19	2.84	68.81	71.39	5.03	—	—	1.86	Eaten by	
10	"	"	Nepaul, 1850	12.90	11.66	1.24	72.30	73.54	6.36	.441	.053	2.00		
Mean				12.73	12.98	1.81	70.56	72.47	5.20	.441	.059	1.93		
BARLEY (WITH HUSK).														
11	"	"	Bombay Bazaar, 1856	—	—	—	—	—	—	—	—	—	Fur Baza	
OATS.														
12	Oats, mixed sample.....	Avena sativa	Jata and Moonghyr....	13.52	10.20	3.62	68.72	72.34	7.09	—	—	3.94	Introduced	
MAIZE OR INDIAN CORN.														
13	Maize, Mukka	Zea mays	Bombay Bazaar, 1856....	13.54	9.99	1.63	73.07	74.70	7.65	—	—	1.87	Eaten ch mas.	
14	"	"	Do. do. 1857....	12.26	8.32	1.55	76.40	77.95	9.37	—	—	1.47		
Mean				12.90	9.10	1.59	74.74	76.33	8.46	—	—	1.67		
MILLETS (HUSK REMOVED).														
15	Millet, Tipsee Gooruroo		Bengal	11.78	8.60	4.16	74.18	78.34	9.11	—	—	1.28	In state nat	
16	"													
17	"													
Mean														
DITTO (WITH HUSK).														
18	Bajra	Penicillaria spicata...	Bombay, 1856	9.82	10.73	3.03	74.46	77.49	7.21	—	—	1.96	Ground w	
19	"	"	Bellary, Madras	12.40	10.06	2.20	73.42	75.62	7.50	.367	.042	1.90	"	
20	Great Millet, Joar Jow- aree	Sorghum vulgare	Bombay Bazaar, 1856...	12.00	9.64	2.15	74.58	76.73	7.96	—	.040	1.65	"	
21	Great Millet, white variety	"	Patna, Bengal	12.70	9.20	1.91	74.49	76.44	8.36	.393	.045	1.70	"	
22	Wuree—Khang	Panicum miliare	Bellary, Madras	11.80	10.41	2.02	71.77	73.79	7.09	.328	.056	4.00	"	
23	Bajra	Penicillaria spicata ..	Narespore, 1856	11.80	10.13	4.62	71.35	75.91	7.41	.260	.042	2.10	"	
24	Tipsee, Gooruroo	Panicum spicata ..	Bengal	12.80	7.98	4.52	71.90	76.42	9.85	.298	.033	2.60	"	
25	Natchnee, Naglee	Elesuino coracana ..	Bombay, 1856	11.16	5.68	.52	80.00	80.51	14.17	—	—	2.64	Used most	
Mean				11.81	9.23	2.62	73.99	76.61	8.70	.329	.043	2.34		
RICES.														
26	Rice, Chanwul, Bansmutti	Oryza sativa.	Bareilly, Bengal, 1854 ..	12.80	8.44	.64	77.62	78.26	9.27	.132	.026	.50	Considera	
27	Rice, British-cleaned	"	Carolina (Lond. 1857) ..	12.16	8.07	.64	78.47	79.11	9.80	—	—	.66		
28	"	"	Java (Lond. 1857)	13.14	7.76	.83	77.92	78.76	10.15	—	—	.85		
29	"	"	Pegu, 1854	13.60	7.49	.40	78.01	78.41	10.47	.124	.041	.60		
30	"	"	Malacca, 1850	12.90	7.21	.60	78.69	79.19	10.95	.154	.037	.70		
31	"	"	Broach, Bombay, 1854 ..	13.10	7.18	.48	78.64	79.11	11.02	.133	.029	.60		
32	"	"	Bombay Bazaar, 1856....	11.60	7.14	.51	79.88	80.51	11.12	—	—	.66		
33	"	"	Bombay Bazaar, 1856....	12.10	6.96	.60	79.86	80.46	11.66	—	—	.45		
34	"	"	Patna (Lond. Mar. 1857) ..	12.80	7.87	.44	78.34	78.75	10.01	—	—	.55		
35	"	"	Arracan (Lond. 1857) ..	13.24	6.48	.56	79.24	79.80	12.31	—	—	.48		
36	"	"	Bombay Bazaar, 1857....	13.00	7.43	.71	77.62	78.33	10.54	—	—	1.24		
Mean				12.76	7.45	.59	78.56	79.16	10.86	.134	.033	.63		

TABLE I. (CONTINUED.)
STARCHES.

root.....	Maranta arundinacea	Ratnagerry, Bombay...	15.18	.71	.69	75.90	76.56	107.69	—	—	1.14
root.....	Sagrus rumphii.....	Sumatra, 1850	14.40	.66	.58	84.26	84.84	151.10	.041	.003	.20
root.....	Maranta arundinacea	Ratnagerry, Bomb. 1850	17.80	.53	1.22	79.87	81.09	155.00	.161	.007	.58
root.....	Curatma leucorrhiza	Rohilchund	16.30	.48	.91	80.81	81.72	170.27	.126	.007	1.50
root.....	Maranta arundinacea	Cannanore, 1853	16.00	.38	.65	82.51	83.16	218.54	—	—	.46
Mean.....			15.94	0.53	0.81	78.87	81.47	160.68	0.109	0.006	0.71

MISCELLANEOUS PRODUCTS.

stain Meal.....	Musa paradisiaca	Madras	13.10	4.27	1.17	78.26	79.43	18.00	0.159	0.010	3.20	Fruit dried and
meal from pith of co palm	Phoenix farinifera ...	—	—	—	—	—	—	—	—	—	—	ground.

TABLE II.—PULSES.
COMPOSITION PER 100 LBS. IN NATURAL OR FRESH STATE.

DESCRIPTION.			COMPOSITION.								REMARKS.	
NAMES.		Date and Place of Growth, or Market whence obtained.	ORGANIC.					MINERAL.				
Common.	Botanical.		Moisture.	Nitrogenous Matter, Gluten, Albumen, &c.	Fatty Matter.	Starch, &c.	Total Non-nitrogenous Matter.	Proportion of Non-nitro- genous to 1 Nitrogenous.	Phosphorus.	Sulphur.		Total Mineral Matter (Ash).

PEAS, PISUM SATIVUM (WITHOUT HUSK).

Wattamah, Gol mat- a, Wattamah	Pisum sativum	Banres, 1850	11.28	26.29	1.13	56.82	57.94	2.05	—	—	2.58
Wattamah	"	Bombay, 1856-7	12.30	27.72	1.82	55.78	57.66	2.08	—	—	2.36
Mean			11.79	27.96	1.47	56.30	57.77	2.07	—	—	2.46

DITTO (WITH HUSK).

Wattamah, Soora Ke a (No. 45, with husk) white variety	Lathyrus sativus	Calcutta vicinity, 1850..	10.10	31.88	.88	54.61	55.55	1.74	.465	.045	3.20
"	Pisum sativum	Bombay do. 1856-7	12.01	25.01	1.73	58.67	60.40	2.01	—	—	2.56
"	"	Banres do. 1850..	12.70	25.59	1.21	58.00	59.21	2.31	.323	.058	2.54
"	"	Do. do. do.....	12.60	21.97	1.12	62.01	63.13	2.87	.269	.062	2.30
Mean			11.86	26.11	1.24	58.33	59.59	2.23	.352	.055	2.64

FAVOURITE PEA, CAJANUS INDICUS, (WITHOUT HUSK) (CALLED "DROLL").

Uttur (Toor Droll)	Cajanus indicus	Jaffrabad, Bombay, 1853	10.06	22.99	1.21	62.66	63.87	2.78	—	—	3.06
"	"	Bombay Bazaar, 1856..	9.86	23.79	1.51	61.60	63.11	2.65	—	—	3.30
"	"	"	9.15	22.30	3.74	61.80	65.54	2.94	—	—	3.01
"	"	Palamcottah	11.60	21.75	1.44	61.71	63.15	2.90	—	—	3.30
"	"	Bombay, 1855	12.30	20.09	1.86	75.15	77.01	3.83	.292	.082	2.90
Mean			10.63	22.18	1.95	63.96	70.91	3.03	.292	.082	3.11

DITTO (WITH HUSK).

Uttur (whole)	Cajanus indicus	Calcutta Bazaar, 1850..	12.80	23.87	1.54	58.39	59.93	2.51	.358	.054	3.40
" (No. 54, with husk on)	"	Jaffrabad, Bombay, 1853	9.74	20.97	1.04	65.73	68.77	3.13	—	—	3.32
" (No. 54, " ..)	"	Palamcottah	11.81	19.37	1.60	63.73	65.31	3.38	.425	.050	3.50
Mean			12.4	21.4	1.37	62.62	64.0	3.01	.392	.055	3.41

LENTIL ERVUM LENS (WITHOUT HUSK) ("DHOLL").

Uttur ("Dholl" from)	Ervum lens	Bombay Bazaar, 1857..	13.69	25.71	1.29	58.40	59.69	2.32	—	—	1.00
"	"	Calcutta, 1854	11.40	26.03	1.00	59.67	59.87	2.32	.337	.064	2.00
"	"	Bombay, 1850	10.96	25.31	1.76	59.77	61.65	2.43	—	—	2.22
"	"	Candesh, Bombay, 1857	10.40	23.49	.99	61.64	62.63	2.66	—	—	2.48
Mean			11.84	25.15	1.26	59.85	61.11	2.43	.337	.064	1.97

DITTO (WITH HUSK).

Uttur No. 68, with husk	Ervum lens	Bombay Bazaar, 1856..	10.72	25.04	1.90	60.15	62.05	2.47	—	—	2.19
" (whole)	"	Calcutta	12.70	24.88	1.02	59.10	60.12	2.41	.332	.046	2.30
Mean			11.7	24.96	1.46	59.63	61.09	2.44	.332	.046	2.25

Not eaten by very
strict Hindus, on
account of its red
blood-looking col-
our.

TABLE II. (CONTINUED.)
 "GRAM-DHOLL," CICER ARIETINUM, WITHOUT HUSK.

64	"Chick Pea," Gram	Cicer arietinum	Bombay Bazar, 1857...	13.38	30.07	1.23	53.58	54.81	1.82	—	—	2.34	In this & largely in article 5
65	"Gram-Doll (Gogaree)"	"	" 1856...	9.75	13.18	3.77	60.77	64.54	2.78	—	—	2.55	
66	"	"	" 1856...	9.07	22.38	4.52	61.42	65.94	2.94	—	—	2.61	
67	" (Jumboosary)"	"	" 1857...	12.06	21.48	4.28	71.82	78.16	3.54	—	—	2.42	
68	"	"	" 1856...	11.40	20.98	3.78	62.04	65.82	3.13	—	—	2.86	
69	"	"	Madras, 1850	11.30	21.04	4.31	60.48	64.78	3.07	.539	.104	2.90	
70	" New Ghatie	"	Bombay, 1857	12.78	19.78	4.47	60.41	64.85	3.28	—	—	2.60	
Mean				11.39	22.70	3.76	63.18	67.09	2.94	.538	.104	2.60	

DITTO (WITH HUSK).

71	Chick No. 66, with husk on	Cicer arietinum	Bombay, 1856	10.80	20.97	3.37	61.98	65.33	3.11	.380	.099	2.90	Chief used for horse-tie, but lbs. per lb.
72	" White Gram," Caboolie, Chuna	"	Saharampore, 1854	12.20	20.65	4.63	59.72	64.35	3.11	.406	.042	2.80	
73	Gram Gogaree, No. 65, with husk	"	Bombay, 1856	9.25	17.98	4.06	66.33	70.39	3.91	—	—	2.38	
74	Gram	"	Madras, 1850	10.40	21.32	4.46	60.42	64.88	3.04	.461	.107	3.40	
75	"	"	Bengal, 1850	11.20	19.51	4.66	61.83	64.49	3.40	.336	.127	2.80	
76	" Gogaree, No. 67, with husk	"	Bombay, 1856	12.48	18.08	4.41	61.81	66.22	3.66	—	—	3.22	
77	"	"	Benares, 1850	12.00	17.79	5.10	62.31	67.41	3.79	.318	.031	2.84	
78	" No. 70, with husk on	"	Bombay, 1857	12.26	17.26	4.46	62.21	66.67	3.62	—	—	3.52	
Mean				11.32	19.19	4.39	62.07	66.47	3.45	.380	.081	3.01	

BEANS (DOLICHOS SPECIES) (WITHOUT HUSK).

79	Wall	Dolichos spicatus	Bombay, 1857	11.00	23.06	2.09	60.50	62.59	2.71	—	—	3.34	Favourite with Him
80	" Ghot Wall," large variety	"	" 1853	12.02	21.04	2.19	60.89	63.08	2.86	—	—	2.86	
81	Chowlee	" sinensis	" 1857	13.12	24.44	2.33	56.75	59.08	2.41	—	—	3.36	
Mean				12.03	23.27	2.20	59.38	61.56	2.66	—	—	3.19	

DITTO (WITH HUSK).

82	Guwar	Dolichos fabroformis	Bombay, 1856	11.3	24.44	.51	60.40	60.91	2.49	—	—	3.35	Most of the cooked the husk
83	Cooltee	" uniflorus	" 1856	10.8	24.57	.79	60.82	63.80	2.96	—	—	3.02	
84	Wall	" spicatus	" 1856	12.4	24.19	.86	79.41	60.27	2.48	.417	.043	3.14	
85	Chowlee	" sinensis	Bellary, Madras, 1859	11.5	22.54	.77	62.34	63.11	2.90	.262	.050	2.82	
86	"	"	Calcutta, 1854	13.2	22.37	.95	60.45	61.43	2.74	.464	.042	3.00	
87	Chowlee	" sinensis	Pegu, 1853	13.4	20.54	2.09	60.17	62.26	3.03	.446	—	3.80	
88	" Pa da Lout"	"	"	12.2	24.06	1.06	61.95	63.17	2.60	.397	.045	3.14	

BEANS (PHASEOLÆ) (WITHOUT HUSK).

89	Ooreed, Moog "doll" Mash	Phaseolus mungo	Bombay, 1857	11.98	25.64	1.61	57.54	59.16	2.30	—	—	3.23	In state man.
90	"	"	Bellary, Madras, 1850	12.90	23.81	1.11	59.98	61.09	2.66	.461	.054	3.10	
Mean				12.44	24.73	1.36	58.76	60.12	2.43	.461	.054	3.17	

DITTO (WITH HUSK).

91	Muht	Phaseolus aconitifolius	Calcutta, 1850	12.4	24.52	.61	58.67	59.28	2.41	.369	.051	3.60	The most are used as well as they are highly as the at
92	Ooreed, Mash	" mungo	Benares, 1850	12.5	24.03	.72	59.65	60.87	2.50	.430	.034	3.10	
93	"	"	Bombay, 1857	9.2	24.45	1.44	61.66	63.10	2.58	—	.135	3.26	
94	"	" (nolent-very Rox.)	Bengal, Calcutta,	11.8	24.06	.76	59.78	60.54	2.61	.349	.073	3.66	
95	Sona Moog	Phaseolus aureus	Calcutta, Madras,	11.4	17.32	2.10	65.48	67.58	3.91	.404	.050	3.70	
96	"	"	"	12.1	23.12	.88	60.80	61.66	2.66	.370	—	3.10	
97	Muht	P. aconitifolius	Bombay, 1857	23.31	.67	—	—	—	—	—	—	3.41	
98	"	"	Bombay, 1856	11.0	22.49	.48	63.12	63.60	2.83	—	.065	2.91	
99	Moog	P. mungo	Bellary, Madras, 1850	12.1	21.61	2.06	61.13	63.19	2.83	.476	.060	3.10	
Mean				12.8	21.65	1.08	61.28	62.48	2.78	.399	.065	3.44	

MISCELLANEOUS PULSES (WITHOUT HUSK).

100	Bhoot	Soja hispida	Benares, 1850	9.74	46.32	12.41	28.43	40.84	0.88	—	—	3.10	Said to be the
101	Catang Tahoo	"	Sumatra, 1850	10.76	41.29	17.64	24.67	42.51	1.03	—	—	3.44	
102	Catang Egow	"	" 1850	—	28.86	1.6	—	—	—	—	—	3.87	
Mean				10.26	38.83	10.56	26.64	41.65	0.96	—	—	4.14	

DITTO (WITH HUSK).

103	Bhoot, No. 100, with husk	Soja hispida	Benares, 1850	10.4	43.86	12.51	28.33	40.84	0.90	.803	.077	4.9	[the "B"]
104	Catang Tahoo	"	Sumatra, 1850	11.3	39.39	17.75	26.28	44.0	1.11	.807	.121	5.3	
105	Catang Egow	"	" 1850	12.0	27.33	1.16	56.02	57.17	2.09	.466	.081	3.6	
106	Pa Yan	"	Pegu, 1850	12.8	33.52	.69	59.58	59.58	2.54	.479	.119	4.9	

NOTE.—The "Nitrogenous Matter" is obtained by multiplying the actual quantity of nitrogen found by 6.3.

FOOD GRAINS OF INDIA.
TABLE III.—(MEAN COMPOSITION PER 100 LBS.)
1. CEREALS.

COMMON.		BOTANICAL.	ON SAMPLE WITH HUSK REMOVED. (Eaten chiefly by Man.)										ON SAMPLE OF WHOLE GRAIN. (Eaten by Animal, and occasionally by Man.)										NOTES AND REMARKS.
			ORGANIC.					MINERAL.					ORGANIC.					MINERAL.					
			Water.	Nitrogenous Matter, &c.	Fatty Matter.	Starchy Matter.	Total Non-nitro- genous Matter.	Proportion of Non-nitro- genous to 1 of Nitrogenous Matter.	Phosphorus.	Sulphur.	Total Mineral Matter (Ash).	Water.	Nitrogenous Matter, &c.	Fatty Matter.	Starchy Matter.	Total Non-nitro- genous Matter.	Proportion of Non-nitro- genous to 1 of Nitrogenous Matter.	Phosphorus.	Sulphur.	Total Mineral Matter (Ash).			
Wheat, Indian		
" European		
Barley, Indian	12.73	12.88	1.91	70.56	72.47	5.20	0.41	0.069	1.93	15.00	12.28	1.56	69.52	70.92	5.70	0.372	..	1.70	..		
" European		
Oats, Indian		
" European		
Millet, Indian		
" European & American	11.78	9.60	4.16	74.18	79.34	9.11	0.134	0.033	1.28	13.00	11.02	2.62	73.99	76.92	8.70	0.329	0.043	2.24	..		
" other observers	12.67	7.45	0.69	78.56	79.16	10.66	0.070	0.006	0.78	13.00	9.93	0.50	76.87	77.37	11.16	..	..	..	..
Starches, Indian	13.00	6.93	0.50	76.87	77.37	11.16	0.109	0.006	0.78	13.00	9.93	0.50	76.87	77.37	11.16	..	..	..	..
Sago-meal, Indian	15.94	0.53	0.91	78.67	81.47	160.68	..	..	..	..	..	..	..	..	..	..	..	..	..
Plantain-meal, Indian	13.10	4.27	1.17	78.26	79.43	18.00	0.149	0.010	3.20	..	..	..	..	..	..	..	..	..	..

Fruit dried and ground.

2. PULSES.

Pean, Indian ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" European ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lentils, Indian ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" European ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Beans, Indian ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" European ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" Chinese ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" English ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" Chinese fabee ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Favorite pea.

Chief food for Horses, in
state of "dull" and
largely by Man.

does cease to do so, it is not because it lacks in well-balanced nutritive power, but because the palate and stomach have become, as it were, wearied; for variety is essential to every dietary that aims at preserving health intact for any length of time.

And, indeed, wheaten bread has been taken by Liebig, the greatest authority of the day, as a proper standard to guide us in the due admixture of the ingredients that, in their sum total, do constitute a suitable diet, and he adds, "that in choosing the various articles of his diet, man is directed by an unerring instinct, which rests on a law of nature, and which prescribes to man, as well as to animals, a proportion between the plastic and non-nitrogenous constituents of his whole diet," and he adds, "it is the elevated mission of science to bring this law home to our minds; it is her duty to show why man and animals require such an admixture in the constituents of their food for the support of the vital functions." One great object in dietetics, then, is to find out the sum that will best express these proportions. "Man's unerring instinct," when left to itself, certainly does lead him, as forcibly illustrated by Dr. Letheby, in his late paper before this Society, to combine, as his means will permit, various articles, so as to ensure a proper balance between essential elements. Still, governments and corporations require the aid of science to decide such points; for one apparently trifling omission in the construction of a dietary, for either soldiers or prisoners, may be the means of depriving the state of most valuable lives, as well as, unwarrantably, of very useless ones. And this, indeed, constitutes an argument for investigations into the food resources of a country, such as that carried out by the East India Company, for such tabular statements place at the disposal of the commissariat officer as well as of the civilian, the means of introducing, with advantage, other than routine articles, should the supply of these be defective.

But to return to the important question, as to what should be considered the proportion that ought to exist between the plastic blood or flesh-forming, and the carbonaceous heat or fat-yielding constituents of a given diet, or, as I shall consider it, grain, for before the comparative nutritive value of the various cereals or pulses shown in these tables can be decided, the standard of measurement must be fixed. The question then is, have we amongst these grains themselves one which will itself furnish this? We have shown the reasons for believing that the flour of wheat contains in proper proportion the elements required to support for a considerable period, the powers of life, and it consequently follows that an investigation into the constitution of wheat is likely to furnish the standard sought for. It will be observed that in wheat the mean of my own experiments places the proportion of non-nitrogenous, or carbonaceous, to one of nitrogenous or plastic, as about five and a-half (5.6) of the former to one of the latter; but as these analyses have been made on the whole grain, the husk or bran of which contains a good deal more nitrogen than the fine flour, six and a-half, although a little under the relative quantity of the above ingredients, shewn by the latest and most trustworthy analyses of bread and fine flour, may be, perhaps, the proper standard. But seeing that experiments with bread fail if much labour be done, suppose that the nitrogenous matter in the fine flour is rather defective in amount, and that the whole meal, which gives rather more than five and a-half (5.6) supplies the proportional factor required; or, seeing that ordinary wheat flour seems to be possessed of almost sufficient power, divide the difference, and adopt 6 parts non-nitrogenous to one nitrogenous, as the statement of the relation that ought to exist between these, and for the present this is what we shall take. And this leads me to make a few remarks on what has been laid down as the true index of nutritive value. It will be observed that what we have been searching for is the number that expresses the proportion that ought to

exist between two essential elements in every food, and it is not assumed that nature has insisted on one of these being more important than the other, or that the human system can permit either to be defective. Both the nitrogenous and non-nitrogenous compounds we hold to be of equal moment, for a definite relationship has evidently been established between them; the destruction of which inevitably leads to decay and disease. As far as the welfare of the human body is concerned, there is, perhaps, no element, not adventitious, that can be held to be of more use than another. The importance of plastic material to yield blood and muscle, and of the carbonaceous to supply the heat and fat, stands out in striking relief, but to the vital wants of the system these are not more important than is the fraction of iron in food which enters into the composition of the blood, and to the essentiality of which, if defective in amount, the blanched lip and quivering heart soon testify.

It has been held, that nutritive power is in exact proportion to the amount of plastic or nitrogenous element, and this rule has accordingly been applied to the various alimentary substances used by man.

As already mentioned, whole meal from wheat contains about one per cent. more of nitrogenous matter than fine flour, and, therefore, applying the rule just indicated, it would follow that bread made of the former would be more nutritious than that from the latter, and, indeed, the poor man has been looked upon as somewhat *doped*, in not having sooner availed himself of the fact, which science is assumed to have laid at his feet. But experience has brought even the hard working navy to a different conclusion. Bulk for bulk, he finds that the fine flour enables him better than the coarse to support the tear and wear of daily toil. Let us admit, however, that this, to a great extent, arises from its physical condition. The labourer finds that the brown bread does not remain long enough to get, as he calls it, the "good of it." The rough brany particles cause a certain amount of irritation, and thus the coarse bread passes too rapidly through the system, and affords too large a residue of that, the removal of which at this moment constitutes a question materially affecting the welfare of the two and a half millions aggregated in this huge metropolis.

The experience of the labourer thus practically nullifies the conclusions of the chemist, as to the nutritive power of the substance we have been considering; but it may be held that if nature had only made bran more soluble and a little less irritating, it would, from its larger percentage of nitrogenous element, be an admirable article of food. Condition, whether affecting raw or cooked substances, must ever be kept in view in drawing practical conclusions as to the amount of benefit the human system will derive from given articles of diet, and we shall, therefore, suppose that this has had to do with the failure which attends the use of brown bread by the working man. But we have a very numerous class of substances largely used for food, viz., the pulses, to which, when husked and ground into meal, the objection that holds goods with regard to the "whole meal" of wheat, will not apply.

In our Indian pulses the proportion of non-nitrogenous and nitrogenous compounds, as shown in these tables, varies from a little more than two up to about three of the former to one of the latter, instead of the five and a-half, as in the case of wheat, or six and a-half in that of fine flour or bread; and there is one bean—the *Soya hispida*—in which I have found the proportion between these elements to have the relation of less than one of plastic to the unit of carbonaceous matter; and which, consequently, if the theory is sound which holds that nutritive value is in proportion to the nitrogen contained, would, in power, exceed that of flesh itself.

To the decision of this point experience again comes to our aid, and her conclusions cannot here be rejected for the same reason as in the case of bran, for neither the eye nor the microscope can detect the rough irritating

particles such as are found in bran or brown bread. Take animals, then, and feed them on beans and lentils, which, according to the theory we have been considering, stand amongst vegetable substances at the head of the list, in assumed nutritive power, and what occurs? The health of animals confined to such, for any length of time, deteriorates, and the same takes place in the case of man, even if too large a proportion of peas has entered into his diet. And the results of the (in the very best sense of the word) truly national experiments that year after year are being carried on at Rothamstead, lead to the conclusion that, practically considered, the theory that assigns to different substances a value in proportion to their nitrogenous compounds, is fallacious; and the far greater demand for cereal than leguminous grains to supply the wants of man and animals, certainly shows, from a very broad point of view, the decision to which nature has come on this subject.

Man or other animals when under the influence of hard labour can, however, take in and assimilate a considerably larger quantity of such highly nitrogenised substances; but observation and physiology lead to the conclusion that under such circumstances they require a proportionally larger quantity of carbonaceous matter, and, as Lawes and Gilbert have pointed out, the system of the labourer undergoing more than usual bodily exertion, seems in practice to call for substances containing even more than the ordinary proportion of carbonaceous matter. And even in tropical India, where a disinclination for much fat is likely to exist, it has been found essential to add extra "ghee" or butter to the diet of the prisoners undergoing manual labour. Extra labour does demand an increased supply of nitrogen in the food, but at the same time it probably necessitates a more than proportionately larger quantity of carbon. The soldier who in darkness and silence works, literally, for life in the out-lined trench, wastes fast his straining muscles, and new flesh-particles, or the elements for forming them must be supplied in his food—but it is not the muscle alone that wears out. Muscular exertion involves accelerated respiratory movement and increased cutaneous transpiration, and through the million outlets presented by the lungs and skin, the oxidised carbon streams with rapidity, and probably in amount proportionately in excess of the extra nitrogenous compounds which have resulted from spent muscle-element. Admit, then, that extra labour involves a demand for the plastic and carbonaceous elements of food even in proportions relatively equal, and it logically follows that, adopting the grounds on which the nitrogen theory itself has been formed, the carbonaceous compounds are of as much moment to even the sons of toil as the nitrogenous, or if our suggestion be correct, they hold the more important position of the two.

We find that instinct, through generation upon generation, has led man to form certain dietetic combinations, the component parts of which have a tolerably definite relation to each other, and it is our object to endeavour to ascertain the proportions which nature shows ought to exist between the various elements that in their sum total constitute a proper food for man. That once laid down we have the key to the chief position; but even then an essential element may be wanting, and here it is that the labours of the chemist are brought to bear with advantage. It has been shown that nature has led man to combine the ingredients of his food in unison with the requirements of his system, which, beyond a certain point, seem to vary in accordance with demands made by climate, labour, &c., upon his power. We likewise hold that however these may be increased, the proportionality existing between the demand for essential ingredients in all probability remains much the same, and from this it follows that, having discovered the relation that ought to exist between the essentials in a given food, the next thing is to accumulate information as to the amount of these elements, so as to admit of proper mixtures or

combinations being made. This is the information which the chemist can afford, and that which these tables are intended to illustrate. The problem, then, is the relation which exists between the essential constituents of a given grain or mixture of grains—which ensures a diet that will support and give vigour to the human frame. Wheat grain in itself seems to present us with the proper proportions, and from considerations already stated, we, for the present, have assumed six of carbonaceous to one of nitrogenous compound as about what should be taken. In addition to this, we have almost the same conclusion arrived at by another route. Founded upon their own and Dr. Lyon Playfair's elaborate calculations, Lawes and Gilbert, by the examination of eighty-three different dietaries, have inferred that a little above five-and-a-half represents the proportion of non-nitrogenous to one of nitrogenous substance, which may fairly be taken as representing the relation between these important constituents. In these the actual proportional number is 5.52, but as this has been calculated on the assumption that starch chiefly existed in these dietaries, and as these all contained a certain proportion of fat, which, if calculated up to its equivalent of starch as a standard, would give a higher proportion of non-nitrogenous to nitrogenous than that stated, it consequently follows that the number which I have adopted will probably come not far from the wished-for point, and even it may be found to be under rather than above the mark. This, then, will constitute what we conceive to be the test of nutritive value, and I trust I shall be excused the time which I have occupied in discussing this part of the subject: for before entering upon the question of relative nutritive value it was essential to lay down and illustrate the principles which have been applied in working out the number referred to. Given, then, 6 to 1 as the proportion between the carbonaceous and nitrogenous compounds, as indicated by the human system, and it follows that in diet or food articles, any quantity (within the limits of error in the calculation) above or below the point thus fixed, will be, by so much, in the true sense of the word, less nutritious, and from this it logically results that, whereas millets and rice are so, from the excess of carbonaceous, over the standard proportion, pulses are less valuable as sole articles of food, for an exactly opposite reason—the excess of nitrogenous diminishing the required amount of carbonaceous; and, consequently, those pulses will prove of most value that contain the least proportion of nitrogen; and it will be presently shown that the two pulses of the East most in favour and most largely used, are exactly those that come nearest to our standard, in consequence of containing a smaller quantity of nitrogenous compounds than the others. The *Cajanus indicus*, in the husked state called "Doll," is eaten in preference to any other, and a common habit with regard to even it, bears out the argument. It is the almost universal custom to prepare this pulse, for edible use, by rubbing it with a little oil, by which means the proportion of the carbonaceous over the nitrogenous is increased. No. 52 in the pulse table, represents an analysis of "Toor doll" bought in the Bombay bazaar, and which had previously been thus treated, and it will be seen that the average proportion of fat or oil in it has been increased from about 1½ lbs. per 100 to 3½ lbs. per ditto, and that the nitrogenous matter has been proportionally diminished by such treatment, and, as before pointed out, if the carbon in this extra quantity were calculated as such, it would give a proportion of that substance 2½ times greater than starch does, and would, by so much, diminish, still further, the proportion of nitrogen to elemental carbon, and bring the substance itself, as an article of diet, still nearer to the standard I have fixed, and, if eaten alone, ensure a proportionately lesser quantity being consumed with impunity, or for a longer time, without detriment to the system: thus affording another example of the manner in which nature

leads man artificially to ensure a proper relation between the constituent elements of his food.

So much for this part of the question. Our standard of comparison now fixed, we are in a position to consider, with advantage, not only these grains, but every diet, however compound. I hope to have the opportunity, on another occasion, of treating at large on the subject of the food of the natives of India, with reference to quality, and, as far as can be ascertained, the quantity also, but for the present I shall confine myself to a statement of the composition of these grains, and of the relation which exists between the amount of principal constituents in these, leaving for another period and place the discussion of the relationship between certain other important elements, which involve details more strictly chemical than those likely to interest the general public.

First, however, before examining these tabular statements which contain in detail the information with regard to these grains, I wish to lay before the public a few remarks on the more prominent points presented by the agriculture of India, which will not here be out of place. The value and pre eminent importance to India of its agricultural products, may be stated in a sentence. According to returns before me, the total value of the agricultural products exported from India in 1853 amounted to £17,484,133, representing more than four-fifths of the then entire value (£21,519,861) of Indian commerce. Of this sum, £889,040 is laid down as that received for the grain products of the soil. Viewing this statement as a whole, it has, with reason, been said that the greatness of India in the world's estimation depends on her agriculture, and that for her future prosperity and progress, reliance can alone be placed on the improved cultivation of her soil, and on the facilities that may be afforded to enable her to bring her products to the best markets, whether in or without the country, at the lowest possible expense.

With regard to the actual cultivation of the soil itself. Considered generally, this is not yet in a satisfactory condition, although considerable efforts on the part of Government have been made to improve it; and Dr. Royle's late work on cotton shows the exertions already devoted to the development of an article of such paramount importance to this country. A good deal of valuable information bearing on cultivation, as practised in the widely separated districts of India, exists, which it would be interesting to give a summary of, but for the present I must content myself with briefly stating that in some points the cultivator in India is not so far behind his European brother as is generally believed. The rotation of crops has been known and practised for ages, and even the rude-looking implements which they employ, viewed with reference to the power at command, the state of the soil, and the means of the ryot, are well adapted to attain the end in view. And in this, as in some other matters, it would be well if attention were directed to the improvement of what has been, and is found, to suit the circumstances presented by an Indian soil and climate, rather than to attempt to supersede these by the introduction of the actual implements employed in this country.

We shall proceed now to the consideration of the composition of the grain products themselves. In the tables placed before the meeting, these will be found to be classified under the usual heads of cereals and pulses, and at the bottom of the cereal table another, denominated "starches," is placed as that substance enters almost entirely into the composition of the articles indicated, and in addition there is at the bottom of both tables a few substances which I have placed there, either from their peculiarity, or from, in one or two instances, the difficulty experienced in classifying them. With regard to the specimens employed for analysis. Upwards of forty of these were furnished me by Dr. Royle, from the new and most important museum of industrial products, rapidly being

brought to completion at the India House. These embrace samples of all the important species of grain cultivated in India; but as the date of growth of many of these goes as far back as 1850, as a check I procured fresh samples from Bombay—some overland within the last three months—and these, in number nearly fifty, have also been subjected to analysis. And I may mention that the two larger tables, 1 and 2, are intended to serve as an index catalogue to the composition of the samples in the bottles on the table.

In an undertaking of this sort it was essential to obtain assistants, whose chemical knowledge and practical skill were worthy of the importance and extent of the undertaking, and it is at once a pleasure and a duty to state my obligations to the zeal and ability brought to my aid during the whole of this investigation by Mr. Frederick Manning and Mr. Wentworth Scott, and for shorter periods by Mr. W. Valentine and Mr. Frank Fowler. To Mr. Manning's experience of upwards of eight years in the Rothamstead laboratory, I am indebted for the admirable and extensive series of estimations on which the principal part of the organic division shown in these tables depends; and it is also due to Mr. Scott to mention that the practical details connected with the mineral department have chiefly been carried out by him.

It will be observed that in drawing out these tables, two chief divisions have been adopted, depending on whether the sample of grain was operated upon whole, or with the husk removed, the last giving the state in which, as a rule, the article is employed for human food. The next two principal divisions are into "organic" and "mineral," and the divisions of these, again, are seen in the tables.

The importance of the constituents, stated under the organic division, at once strikes the mind, but, if time permitted, it would not be difficult to still further illustrate what I have already briefly indicated, viz., that, viewed with reference to the essential wants of the system, and to effects produced upon it, the organic is not, in this point of view, of more importance than the mineral. Of the mineral constituents, the phosphorus, sulphur, and iron are the elements that have chiefly received attention. The contents of the central column within the heavy lines, showing the proportion of non-nitrogenous to one of nitrogenous is that which will, however, chiefly for the present occupy our attention, as, if the arguments brought forward in this paper be correct, that it is which affords the indication of true nutritive value.

At the head of the list of cereals stands wheat, the great food-grain of this and other European countries, and one which in Central India, and to the north, as well as almost to the sea-side in Guzerat, occupies a prominent position in the agriculture of the country. Of Indian wheats, as shown in Table I., eight samples from various districts through India have been submitted to analysis, with the general result of showing a composition fully more identical with that of the wheats of Europe than is generally supposed to be the case. For the statements in Table III., which, under these analyses of the several species of Indian grains, shows the average composition of a number of European wheats, &c., I am indebted to Dr. Gilbert, who has calculated these as the mean from a great number of analyses; but as these embrace the results of one large series of analyses, which all late observations show to be too high, it is quite probable that a fresh investigation of these European wheats would show that they contained fully a less proportion of nitrogen than even that shown in the table. It will be observed that every 100 lbs. of these European wheats contain 15 lbs. of water, whereas the Indian ones have only about 12 and a-half pounds. It consequently follows that a given weight of Indian wheat will contain more nutriment than the same quantity of European, because there is more water in the latter than in the former;

although, if we drive off the whole of the moisture from both, and make the quantity, in either case, up to 100 lbs., it will have the effect of showing a slightly larger proportion of nitrogenous matter in the European, than even that shown in the table. In the average statement, shown in Table III., it will be observed that the proportion of non-nitrogenous to nitrogenous, is within four-fourths of the standard 6 to 1, which nature has apparently settled to be the relation demanded by the requirements of the system. Upon this showing, the whole grain of wheat would require to have a proportion of starchy or fatty element added, in order to dilute or bring it down to the true proportion,—a thing, by another mode, accomplished by the sieve separating the more highly nitrogenous bran from the flour.

With regard to practical qualities, arising from the physical condition of the grains themselves, a word may be said, as it bears on the question of the suitability of Indian grain for the markets of England, a point which Dr. Royle has fully discussed. The Indian are, as a rule, what are called "hard wheats," in which the outer portions, consisting of a very dense substance, are difficult to reduce to fine flour—indeed, proving so detrimental to the mill-stones themselves, that our millers reject them for this cause alone. But the whole question of the practicability of the introduction, at a suitable profit, of Indian wheat into our European markets, supposing,—which appears to be the case,—that the original cost in India and the expense of freight to this country would permit of this, is, for the present, settled by the weevil, a small insect, specimens of which, I dare say, can be detected amongst these samples, although some have in order to destroy them, been subjected to nearly the heat of boiling water. The destructive powers of these little creatures, from their numbers, are enormous. Many of the cargoes of wheat attempted to be introduced into this country have been thus all but completely spoiled, and our grain merchants are naturally very loth to admit even partially damaged cargoes into their granaries. These insects are not destroyed by any amount of heat which can practically be applied to wheat in the mass. Cold seems the only means by which they can be removed. With regard to the value in our market here of Indian wheat, I have submitted the samples on the table in Mark-lane, and have found that on an average, cargoes of these would fetch from 35s. to 40s. A cargo of No. 97 was brought from Madras, and cost here 36s. per quarter. It weighs the full weight of 62 lbs. per bushel—is in pretty fair condition, and is now being employed to add "strength," as it is called, to some soft wheat, the two being mixed in certain proportions. So much for wheat. Next on the list stands barley. This is much used in Northern India, and constitutes a chief article of food in many districts. One of the specimens on the table is from Nepaul and very fine. It will be observed that Table III. shows the mean composition to represent the existence of a smaller proportion of carbonaceous matter to nitrogenous than wheat does, and that, as an article of food, according to the mode proposed of indicating nutritive value, it would require to be diluted, as it were, by the addition of a larger proportion of carbonaceous matter than the whole meal of wheat does. Compared with European barley, it will be observed to contain upwards of two per cent. more of nitrogenous matter.

With regard to oats little need be said. A number of years ago, the *Avena sativa*, the common oat of this country, was introduced by some European gentlemen as food for their horses, and around Patna and in Moonghyr it is now cultivated in some quantities, but not being a stock article I have only submitted one sample to analysis. It looks poor and husky, and contains about three-and-a-half per cent. less gluten, &c., than the European oats shown below it in Table III. The proportion of non-nitrogenous to nitrogenous matter in it, viz., 7.09 to 1, shows that, compared with the standard it contains a

little too much carbonaceous matter, and would consequently require to have a small quantity of some grain containing a larger proportion of gluten, &c., added, in order to bring it to the point required. Of samples of Indian corn in a state suitable for my operations, I could only procure two. These, on the average, contain 9 per cent. of gluten, being nearly 2 per cent. less than American, but the chief peculiarity is in the small amount of fat found in these specimens; although this constituent must vary considerably in different samples. For Dumas and Payen procured 9 per cent. of a yellow oil from maize, whereas Leibig has stated 4.25 as the amount which he found.

We come now to a class of grains, the millets, which occupy a position second to none in the country, and which form the staple food of a larger number of the population than, perhaps, all the other cereals put together. At the head of the list of these stands the great Indian millet called *Bajra*, and which itself, with the usual adjuncts of a little milk, &c., forms the chief article of diet of a very large number. Compared with rice, it will be observed to be considerably more nutritious, containing about ten and a-half per cent. of gluten, and giving a proportion between the carbonaceous and nitrogenous compounds of from 7 to 7½ of the former to one of the latter, whereas the one of all those rice on the list most rich in gluten contains only about eight and a-half of that substance, and gives the proportion already so often referred to, as a little more than 9 of the non-nitrogenous to the nitrogenous,—thus involving the addition of a larger proportion of some pulse or extra nitrogenous substance to increase the proportion between the flesh-forming and heat and fat yielding constituents. The Millet *jowaree* stands next in order of importance, both on account of its intrinsic value, as well as of the numbers it chiefly supplies with food. A glance at the table will show how it stands with reference to the last mentioned as well as to rice, and will save the tediousness of repeating in almost the same terms facts that can be seen at once. With regard to the millet which very properly stands at the bottom of the list, viz., *Khang* or the *Eleusine coracana*. Its low nutritive power is at once seen, and the necessity for adding pulse, &c., in order to bring its important ingredients into proper proportion. This grain, in some districts, is looked upon entirely as a famine food, and only had recourse to in seasons of drought, when other crops are very defective. In some places, during ordinary seasons, as much as from 130 to 140 lbs. are procurable for a couple of shillings.

We have next to consider rice, which is supposed to feed a larger number of the human race than any other grain, but, as already pointed out, rice is not employed alone to support animal life, and, indeed, the attempt to do so could not be otherwise than attended with failure, unless the stomach of the native had been made about exactly twice as large as it is, and his system endowed with extra capacity for getting rid of a very large quantity of superfluous carbon.

Rice is very largely employed, and certainly is a most important article of diet, but its chief property, in one sense, may be called negative. It plays the part of a diluent to highly nitrogenised compounds, and affords the bulk which seems essential to the formation of a wholesome diet. Rice is, therefore, rarely eaten alone; and when it is so, only from compulsion, as occasionally amongst some of the poorest classes in Arracan and adjoining districts.

Viewed with reference to the wants of the system, it will be observed that the proportion of carbonaceous matter to plastic, which it contains, is nearly twice as great as it ought to be. In order to afford, from my own laboratory, the means of comparing it with others, the vaunted Carolina rice has been subjected to analysis, and the result is that, as may be seen in the table, in point of plastic power it would have stood at the top of the list, but for the Bengal variety of rice, called *Bengal*.

Next to the Carolina rice comes a specimen of Java rice, which, in point of nutritive power, is within a fraction of its American brother; and, although its nutritive properties, also, are such as barely to permit it to be distinguished from the Carolina, its average price in the market here is several shillings per cwt. less than American cleaned Carolina, or nearly one pound less than British cleaned ditto, a little extra manipulation in this country costing some 15d. per cwt. and, even then, only a practical eye can tell the difference.

Of the "starches," embracing arrowroot, sago, &c., little need be said. A glance at the tables shows that, in these articles, nutritive power is at its minimum, as far as the plastic wants of the system are concerned. The plantain meal mentioned contains much more than any of the others in that part of the list, but, even it, in nutritive power, is not far from being one-half less so than rice, containing as much as 15 per cent. of carbonaceous to nitrogenous matter.

We shall now shortly turn our attention to the pulses. From considerations already adduced, we have seen that the nutritive value of these must be calculated not in accordance with largeness in amount of nitrogenous matter, but in proportion to relatively diminished quantity. From this, as already mentioned, it follows that the *Cajanus Indicus*, the favourite pea of the country, and the *Cicer arietinum*, or "gram," the chief food for our horses, and often of man, too, are precisely those in which the proportion of carbonaceous to non-carbonaceous is highest.

According to this showing, the *Cajanus Indicus* stands next, and gram next; then follow the Dolichos beans, the next in favour, too, as articles of food; then we have various Phaseoli, and the *Brown Lens*, and lastly, common peas, which seem to contain the largest quantity of nitrogen, and which, therefore, demand an extra quantity of carbonaceous matter in order to obtain the standard mixture of six to one.

Experience has thus pointed out the two substances as the best most suitable as articles of diet, and I believe that their introduction into this country will prove of great use. There are many cases in which, on very-headed pulses would prove of great service, and it will probably be found that these two ground and eaten well in point of efficacy far exceed the Egyptian food, for which my numerous friends the public has to pay so much.

From a cheap and house food of the country, and I believe that it stands with a fair proportion of hay, to be obtained there does not exist in any country a better article for such a purpose of equal value. In the case of the latter, it is parched, and on the voyage, or in the case of the former, which prevent, (according to his statement) working operations being carried out, and the rice is the staple food of the Sepoy.

The pulses, in the varying proportions, are cultivated in the provinces of India, and their importance, as articles of food, has been shown to furnish the natives of India with a very considerable portion of their food, and it is a very considerable portion of the food of the natives of the Sepoy.

It is a pleasure to me at this time of the meeting nor to be able to say that the *Journal* will permit me to say a few words in this direction of my subject. The *Journal* is a most valuable source of information which I am sure will appear in a subsequent issue.

There are, however, two vegetable articles which are being out in strong relief, and which are of great amount of important value. The first is the *Soya hispida*, called "soybean," which I find to contain the largest amount of nitrogen, about 10 per cent. of the dry weight, and about 10 per cent. of oil or fat, about 10 per cent. of carbonaceous matter, and a quarter of sulphur, and a trace of iron.

With regard to it, I have been able to obtain but little general information. In Simmond's work on the commercial products of the vegetable kingdom, it is mentioned to be the source of the well-known "Soy sauce," but it is not shown and procured in quantity, as an addition to other food, it is probably, for feeding purposes, would be found to exceed in value that of any vegetable substance now known.

The other product, to which I would briefly refer, is *Manis*, as having come from Sumatra. It bears the native name of *Cajuput arao*, and is probably a *Dolichos* bean, like the former.

I have, likewise, been able to obtain only meagre information. In Mr. Simmond's work, a leguminous plant is mentioned, which furnishes, on crushing, a residuum known under the name of *Tanping*, and which, in the form of a dry paste, is brought to Sumatra, in a quantity amounting in value to two and a-half millions sterling. This last fact is stated on the authority of the Rev. Mr. Medhurst, of Shanghai, and Mr. Thomas, British Consul at Ningpo. The bean referred to is stated as being imported into China, pressed for its oil, which is used both for eating and burning, and the residuum, in form like large cheeses, is said to be distributed about China in every direction, and used as food for pigs and buffaloes, as well as for manure.

Although I am not in a position positively to state that the bean which I produce this evening is identical with that referred to, still its composition leads me to infer, that if not the same article, it is one perhaps equally worthy of the attention of the agriculturists of this country. On analysis, I find that it contains per 100 lbs. weight, 39.39 lbs. of nitrogenous matter; 17 lbs. 12 ozs. of oil or fatty matter; about 9½ ozs. of phosphorus and nearly two of sulphur.

There are many other special points of interest connected with the subject which I have attempted to bring forward this evening. These, however, must remain for another opportunity.

DISCUSSION.

The CHAIRMAN said he was sure the Society of Arts felt much indebted to Dr. Watson for having given them the benefit of his recent labours. Dr. Watson had been engaged by the East India Company in investigating some of the principal varieties of the food grains of India. At a later period of the evening he (the Chairman) would make a few remarks upon the chemical part of the subject, but at present he felt it would be presumptuous in him, in the presence of one who had devoted so much attention to the vegetable produce of India, and who could give so much information on that subject, to venture to lead the discussion in any way; he would, therefore, call upon Dr. Royle to favour the meeting with his remarks upon the paper.

Dr. FORBES ROYLE, F.R.S., said, the subject was of great importance, and of great interest to himself, and was, moreover, one upon which there was but little information which could be depended upon. He congratulated the Society and the public upon this exact determination of a number of facts hitherto unascertained. He entirely agreed with the author of the paper in repudiating the idea which had generally prevailed in this country that the natives of India lived for the most part on rice. It was only in particular places, in some of the deltas, that rice formed the staple article of food, and it was then mixed with ghee or butter. The principal articles of food throughout India, were the cereals and pulses of which mention had been made, and an interesting point with regard to these was that the climate enabled them to obtain two distinct crops in the year; one, the rainy season crop, and the other the cold season crop. There were, therefore, large quantities of nutritive diet, cereals as well as pulses, all over India, although, from a deficiency of rain in some parts, the crops would occasionally

be materially affected. Dr. Watson had called attention to the nutritive nature of the *Cajanus Indicus* and the *Gram*. In the north west provinces of India, sheep were fattened for the table upon the *Gram*, and the meat was of the most nutritious character. With reference to oats, the specimen which had been analysed was an unfavourable one, having been sent to this country in 1851, from Patna, the lowest part of the province where oats were cultivated. In the north-west provinces, where horses were bred, better oats were grown, and formed a nutritious food for those animals. In the hill districts barley of fine quality was grown, and some of the finest kinds of wheat were cultivated in the neighbourhood of the Nerbudda. Professor Solly had made analyses of both the hard and soft wheats of India, and at that time, wheat being dear, the samples sent over were valued at 106s. and 100s. per quarter—5s. per quarter more than the highest price of English wheat. The white wheat was least esteemed by the natives of India, the hard wheat being considered the most nutritious. He did not know whether chemical analyses bore out the native opinion in this respect. He could not but congratulate those connected with the Exhibition of 1851, upon the results accruing from the collection of so many materials of food from all parts of the world, especially from India. Many specimens of the grain analysed by Dr. Watson were collected on that occasion, and were found still to be in an excellent state; and the remarkable pulse, to which he had drawn attention, was one of those upon which it would be desirable to obtain further information, for, he believed, it might become an important article of commerce, when its valuable qualities were better known.

Mr. RIDDELL had resided for a long time in India, and was acquainted with almost every kind of grain produced there. He would corroborate the statement, that rice certainly did not form the chief article of food of the natives, although it was to be found in almost every part of the country, and there were no fewer than between 70 and 80 species of rice shown at the Madras Exhibition. The natives themselves used the commonest descriptions of it for their own eating, the finer qualities being reserved for the rich man's table, and the growers seldom tasted of their own produce. That rice, itself, was not so nutritious as many other grains, could not be doubted; but, when mixed with some of the vegetable products now before them, he believed it formed as nutritive food as wheat itself. Indian wheat ground into flour would not keep good for any length of time, and hence the bread and biscuits made in Calcutta for the navy were manufactured from newly ground wheat; indeed, the European and Cape samples were preferred to those of native growth. He had found that wheaten flour, kept in the best possible way, became mouldy in three or four weeks, and, for that reason, the natives and bakers always used it fresh ground. In the district of the Nerbudda, he had seen wheat growing in such quantities that there was not sufficient population to eat it and it remained on the ground. If means of conveyance to the coast could be obtained, they would have large quantities of wheat for exportation. He would mention, with regard to the gram, that he planted some in June last, soon after his arrival in England, which had produced as fine seed as any he had seen in India. With reference to the Dolichos, his idea had been that it was cultivated in England, and he had heard that in this country they manufactured soy from it. He believed that Indian beans, and many other seeds of great value, might be successfully cultivated in this country. With reference to the larger descriptions of millets he could say nothing, except that they were very prolific, and found to be highly nutritious diet, judging from the healthy appearance of those who used them. Spices and other condiments appeared to increase the nutritive qualities. With reference to Indian corn—the large corn—there were two kinds grown, one of which he had himself seen bearing on one stem seven or eight large

heads, some of which produced as many as 500 seeds. The colours of this grain were yellow, red, and white. That it was a highly nutritive food there could be no doubt. Man thrived well upon it, when it was eaten either boiled or roasted; and cattle were fed upon the stems, which contained a large quantity of saccharine matter.

Mr. P. L. SIMMONDS said that his name having been mentioned by Dr. Watson in his paper, he might be permitted to make a few remarks, the more especially as the subject of the paper was one of those which he had suggested to the Secretary some time since, as one on which it was highly desirable to elicit information. He was, therefore, glad it had been so promptly responded to, and so ably dealt with. The analytical and chemical portion of the subject being that which had been chiefly discussed so fully, he would confine his observations chiefly to the commercial aspects. The consideration of the food grains and pulses of India, nay, even of the roots, starches, and fruits of the East generally, was of considerable importance, not only to the natives who produced them, but also to many of our colonies, which depended chiefly on them for supplies, and to the inhabitants of Europe. Although it was endeavoured to be shown that rice was not the only food of the natives of India, still it could not be denied that it formed the chief bread-corn of the East, and was the principal grain exported from India. Not only did it form an article of immense consumption in China and most parts of India, but it was shipped in large and yearly increasing quantities to the Straits settlements, our colonies in the Indian Ocean, to Australia, and to Europe. At least 3½ million bushels were annually shipped to Ceylon, to feed the 60,000 or 70,000 Indian immigrants who went there to labour on the coffee plantations; 60,000 or 70,000 bags a month were also required for the Mauritius, besides large quantities of grain for the Coolies employed on the sugar estates. With the extensive Chinese emigration now going on to Singapore, Malacca, Penang and Australia, in each of which there were probably 50,000 or 60,000 Chinese located, and the number yearly increasing by thousands, there was necessarily a large demand for rice for a population otherwise engaged in producing sugar, spices, and other staples, and not producing food-grains. Our own imports of rice were also largely on the increase, for we could depend on receiving but a very small supply of the choice rice from Carolina, which had been alluded to by Dr. Watson. Slave labour was found to be more profitably employed on cotton, and the crops of South Carolina rice were therefore yearly declining. But unlimited supplies could be drawn from the East, whether of the superior Java rice, or of the more ordinary Indian qualities. While in the Irish famine year of 1847, we received but 588,708 cwt. of rice, and in 1853, but 1,504,629 cwt. of cleaned rice, and 19,500 qrs. of paddy, or unhusked rice; last year we imported 3,889,969 cwt. and 33,000 qrs. of paddy; about half of which was entered for home consumption. And this year, notwithstanding the commercial and political disturbances, the amount in the nine months of the year reached about 2,000,000 cwt. Rice, it should be remembered, entered into use, not only for food, but also for starch and the cotton manufactures, in aiding to form the weaver's dressing for warps, and for feeding stock. It had the advantage over most other grains, that it would keep good for years in its unhusked state, and for table use old rice was preferred to new. Owing to the wide extent of Indian territory available for rice culture, it was impossible for the grain crops to fail universally. Within the last 15 or 20 years, the province of Arracan had become the granary of a great part of India and Europe, and the rice garden of our eastern settlements. Increased land has been brought under culture, and the trade in produce had been steadily developed, until Arracan now competed with Bengal in the rice trade of the continent; and the exports, which in 1880 occupied only a few coasting vessels, in 1857

quired more than 100,000 tons of shipping. The exports of rice from Akyab, which, in 1849, were only 65,000 tons, in 1853 exceeded 120,000 tons; while the Bassein district shipped 150,000 tons, making a shipment of 270,000 tons of food grain from one small quarter of the Arracan Province. Considerable quantities of rice were also shipped from Moulmein, from Tavoy and Mergui. From Madras the exports of rice in 1856 amounted to 118,384 Indian maunds (about 88,750 cwt.) From Calcutta the average exports were 200,000 tons a year, of which one-half came to Europe, one-fourth went to the Mauritius, and the remainder was shipped to Australia, North America, and other quarters. But in the paper they had just heard, various other important grains and pulses are enumerated; but these do not form a tithe of the food plants of India; and respecting the culture, yield, and comparative value of many of these, information was much sought, both in a scientific point of view and in the consideration of which of them it would be desirable to recommend the culture of in other quarters, such as in America and in our own colonies. This was a point to which his (Mr. Simmonds's) attention was often drawn, when in correspondence with foreign Agricultural Societies of which he was a member. One stumbling-block was the numerous vernacular names by which a particular plant or its grain was known in different localities in India. The native dialects were so numerous, and the name varied with the wet or dry crop, while the botanical name was so seldom given, that it was difficult to identify from the seed alone the numerous varieties of millets, and the pulses, passing under the common general name of Doll and Gram. This was a difficulty which he had met with in preparing the work on Vegetable Products which Dr. Watson had alluded to, for though he had been induced from the current interest of the food question at the time of publication, to devote a very large portion of the work to details connected with food plants, he had not been able to be so precise and accurate in his descriptions respecting the Indian grains and pulses as he could have wished. Some ten or twelve years ago he had endeavoured to diffuse information on the agriculture of Hindostan in a series of papers published in his *Colonial Magazine*, and although the subject had not then the importance with which it was now invested, still it had enabled him, in connection with the fine collection of grains shown at the Great Exhibition, the reports of the Madras Exhibition, and a study of Col. Sykes's observations on the cerealia of India, to master many of the difficulties which had previously stood in the way. A little work, on which he had been for some years engaged, a dictionary of trade products, which he hoped would be published in about a month, would probably be found useful to many, for in it the various names would be given under which different grains and pulses were known in the various districts of the East. With respect to the leguminous plant alluded to in his work, cited by Dr. Watson, he had not yet been able to obtain any definite information respecting it. At a meeting of the Society early last year, he had placed on the table, with numerous other specimens of grains and seeds, some of these large white Chinese peas from Sumatra, and which formed so large an article of commerce there. From the appearance of the pulse it certainly was not a *Lathyrus*. That from Sumatra, shown in light, judging from the analysis of Dr. Watson, was well worthy of extended cultivation. Mr. Simmonds added that he had found no difficulty in raising varieties of Doll and Gram in the greenhouse, if sown at the proper season. Dr. Watson had stated the value of the whole of the grain exports of India at 200,000,000 for 1853. He thought that a very low estimate, looking at the statistics which he had cited of the rice exports alone, exclusive of other grain and pulses. Probably this arose from a very low official export value in the Customs records. The food resources of India, its capabilities of supplying home and export demands, considered as they would be with the

cheaper transport to the towns and coast, arising from improved land and water communication, and greater facilities afforded to colonization and land settlement, were questions of the highest importance to India, to the adjacent colonies, and to Europe.

Dr. ROYLE said that the details of every one of the grains, alluded to by Mr. Simmonds, would be found in Dr. Roxburgh's *Flora Indica* as the result of examinations made at the beginning of the present century. In that work he believed every species of grain known in India was botanically treated of, as well as the mode of cultivation which each required.

The CHAIRMAN said, there was one point upon which he was sure the meeting would like to hear the experience of Indian gentlemen,—several of whom he saw present—that was, as to the influence which the various kinds of food throughout India exerted upon the character of the population. In the narrative of the recent travels of Dr. Livingstone it was worthy of observation that the character of the nations through which he passed depended upon the habits of the people in the acquisition of their food, as well as upon the food itself. For instance, the Kaffirs, who lived by hunting, and were flesh eaters, were wild and warlike. Then there were the Wampoes, who lived principally on grain, and were of a more quiet and peaceable disposition; then, again, there were the Bituanoes, who lived upon grain, were more civilised than the Kaffirs; and again, the Macololas, who combined as their food both grain and flesh; they did not lose the warlike character, and made incursions upon their more feeble neighbours. It was an axiom amongst the latter people that if it were not for the gullet (alluding to their appetites) there would be no war or fighting amongst mankind. In those parts, such as Loando, where the people lived upon starchy varieties of food, they had become diminutive in their stature, and this applied, not merely to the natives, but also to the Portuguese settlers there, for they had lost the physical characteristics of their ancestors, and had become feminine in their frames and habits; and this extended even to their handwriting. Where more nitrogenous food was taken the physical character of the people had not undergone that very marked change. It had been calculated that there must be thirty-six ounces of nitrogenous matter per week in the food of a man to make him fight. The Dutch soldiers in time of peace were allowed twenty-two ounces of nitrogenous matter, but they could not fight upon that; when required to fight they were allowed 36 ounces of nitrogenous matter per week. It would therefore be most instructive to hear what were the habits of the different nations in India with reference to their food—not merely the proportion of nitrogenous matter, but the amount of real flesh taken with their grain food. He felt quite confident that the Ghoorkas, those brave little warriors who had so much distinguished themselves during the late rebellion in India, partook of a large amount of nitrogenous food. He hoped Dr. Watson would discuss this interesting subject in his next paper, inasmuch as accurate data upon that point were very much wanted. As yet they had not sufficient to judge of the full effect of food upon the different races—not only as regarded the question of the food itself, but as to the mode of acquiring it, which also had an effect upon the character of a people. In illustration of this, he might take the people of Ireland. If they had a population depending upon a certain quality of food in which carbonaceous matter had an undue proportion to the nitrogenous matter, certain results must follow. In the first place, the wages of labour could not be high, and the state of the country must be low as long as the people continued to live upon such a character of food. Before a man could compensate for the expenditure of muscular power consequent upon a day's hard labour, he must eat from 14 to 15 lbs. of potatoes; this was, in fact, impossible. A

man could not take more than 7lbs. of potatoes per day, and a woman 5lbs.—their bodies could not contain more. Therefore the labour so sustained was only half the value of that of the wheat-eating men of this country, who also ate flesh and labour-producing matter. Give an Irishman potatoes in this country, and an Englishman wheaten food, the very character of the diet would make the former worth only half the wages of the latter. It was the nitrogenous and flesh-forming matter which, in the competition of labour, gave the superiority to the English workman. But as he had before remarked, it was not only the description of the food itself but the habits of procuring it, that constituted the difference of the physical characteristics. When the Irish depended chiefly upon potatoes their labour was called for only twice in the year, namely, at seed time and harvest. During the rest of the year they had nothing to do; and, therefore, labour, instead of being steady and continuous was impulsive. In point of fact, the famine in Ireland was one of the greatest blessings that could have befallen that country. It caused them to depend less upon what had hitherto been the staple food of the people, and which had kept wages low and rendered labour impulsive; and it created a demand for other kind of food in order to avert a potatoe famine for the future; and thus labour became distributed over the year to the benefit of the Irish people as well as of this country. He would now say a few words with reference to the chemical part of the subject. Perhaps a little too much stress had been laid upon the nitrogenous theory of food. Liebig had shown them what the nitrogenous matter of food was, and the functions it performed in the building up of the frame-work of the body. The non-nitrogenous kept up the respiration and heat, but was not used in the construction of the frame-work of the human machine. Knowing therefore the discoveries of Liebig, and his process of thought during the time that those discoveries were made, from a constant correspondence with him at that period, he (the chairman) in lecturing upon those views had never intended to represent Liebig as saying that unless there was a due balance between nitrogenous matters and carbonaceous matters, the proper nutriment of the human frame could not be carried on. The case was just this—supposing they had a machine at work; it required iron for the frame work, coal for fuel, and steam for motive power. The machine could not do with any one of these elements alone; and if repairs were required, they must be effected with the same material as that which had been expended. They could not repair the iron frame with coal; they must use the same description of material. In like manner, the views of Liebig were that the nitrogenous matters were the nutritive matters of the machine, which formed the basis of our bodies, and the other materials, the non-nitrogenous matters, kept up the great functions of the body, producing not only vital heat, but the powers necessary to the action and motion of the machine. Dr. Watson had done great service to science by insisting upon a due proportion between the non-nitrogenous substances and the nitrogenous, but he (the chairman) did not quite agree with him as to the exact proportions of the two. Let it be taken that the proportion of flesh-forming ingredients to non-nitrogenous should be as 1 to 6, that would be only a rough approximation; for this reason—the non-nitrogenous matters were varied in their composition, whilst the flesh-forming were nearly always the same. It was of small consequence whether the flesh-forming matter was derived from one ingredient or another. Thus, in a hunt, they had an omnivorous man, mounted upon a graminivorous horse, accompanied by carnivorous dogs, pursuing a vegetable-eating hare or a flesh-eating fox. Therefore, whether the non-nitrogenous matter was got from vegetable or animal element, was indifferent. But it was not so with regard to the flesh-giving matters. There was one point which was especially perplexing to chemists—that was as to the

quantity of fatty matter that was used in the food of people of hot climates, such as India. They could readily understand why fatty substances were largely consumed by the people of the Arctic Regions, in order to supply the fuel to keep up the bodily heat in cold climates, but with regard to India it was more difficult of comprehension. He (the chairman) thought that it might possibly serve to prevent the too great perspiration of the body, as they found in tropical climates it was the custom to smear the body with oil, to prevent the too rapid withdrawal of water from the system; and if the people partook of oleaginous matter it might possibly have a similar influence.

Dr. ROYLE said, when he was in the North-Western Provinces, he saw a good deal of the Ghoorkas, and he could state that in their habits of living many were nearly approximated to the European. They were fond of field sports, and were good marksmen with the musket, eating the game they shot, together with vegetable diet.

Mr. J. GRIFFITH FAIRH, in adverting to the statement that wheat imported into this country from India was of little value in the market, mentioned that he had known that wheat to be sold at a very high price. The great evil with regard to the Indian wheat was, the presence of the weevil, in some cases to such an extent as to render the wheat almost valueless. He wished to inquire whether the hard or soft wheat was most subject to the attacks of that insect.

Dr. ROYLE remarked that, at present, entomologists were at a loss to account for the manner in which the insect got into the wheat. On the occasion of Professor Solly's analysis of wheat from the Nerbudda, the presence of the weevil was detected to a considerable extent. On examining the wheat under the microscope, small appearances were noticed, which seemed to indicate that the insect attacked the wheat in a growing state, but at what stage he was unable to say. The opinion of some entomologists was, that the wheat was attacked by the weevil when deposited in the granaries. Others were of opinion that the ova were deposited in the growing grain. Wheat had been sent from India to Australia without being attacked by the weevil.

Mr. PHILIP PALMER said, now that they were sending large bodies of troops from this country to India, it was important to know what effect, upon the constitution of Europeans, the use of these different grains as food would have. Each province of India had its peculiar food; and as they had been told by the learned chairman that a certain quantity of food was necessary for the performance of a given amount of labour, it became a matter of interest to know how their countrymen, now going out to India, would fare in that respect, and what description of food would be given them.

Dr. WATSON replied that the food supplied to the soldiers in India did not differ materially from that to which they were accustomed at home. About the same proportion of flesh was allowed. However, he thought, if Europeans assimilated their diet more to that of the natives it would be beneficial to them.

Mr. RIDDELL mentioned that when in India he had always understood that considerable quantities of wheat were exported to England. At the same time, he believed it would be found that this was only the case when that commodity was fetching a very high price at home, for he was of opinion that the Indian was not worth more than two-thirds of the value of English wheat. That it was wanting in the nutritive power possessed by the English grain there could be no doubt. He thought one reason for this was the difference in the length of time in which the grain came to perfection. In India the wheat was sown after the rains, and three months afterwards it was reaped. Until means of communication were opened in India, from the interior to the coast, it was not worth while to export wheat. Indeed, in many parts of the country where wheat was most plentiful, even if it could be obtained for nothing, the

of conveyance to the coast would be so great that it would not be worth the cost of carriage.

Mr. THOMAS SCOTT remarked, that in a country like England, where they had the fullest means of selecting the diet which they preferred, the elaborate research which they saw before them in the tables now exhibited might appear a useless work; and he had heard the same remark applied to the able paper of Dr. Letheby on a similar subject read last session. It, however, must be admitted that the results obtained were most important. But, leaving man out of the question for the moment, and taking the various articles applicable to the food of domestic animals, they had, by inductive reasoning, arrived at the most invaluable results. Thus, in the feeding of animals they now were able to supply the food in the first instance which contained the elements for building up the frame of the growing animal, and afterwards food containing different elements for the fattening of the mature animal. Again, with regard to vegetable physiology, they were all aware of what had been done by Liebig as to the management of the feeding of plants. It was scarcely necessary to follow out the argument of the learned chairman that the character of a people was regulated by the food on which they lived. He (Mr. Scott) had employed many hundreds of Irish labourers, and when they arrived here, and took a different kind of food, their labour, which was worth only 10d. per day in Ireland, was worth 8s. 6d. in this country and was, moreover, more profitable to their employers at the higher than at the lower sum. The famine in Ireland had created an entire revolution in the domestic and social economy of that country. They ceased to regard the potatoe as the staple article of food. A demand upon the labouring population was made, and the character of the agriculture of the country was altered. It was now the case that almost everywhere the people sold their potatoes, as well as the whole of their oat crops, with but few exceptions. The better class of labourers used to eat oatmeal, but now they took maize, because it enabled them to work better. It was desirable to feed the labourer with food that was proper for the demands made upon his muscular energies; but it was necessary, in the first place, to create a taste for that food.

The CHAIRMAN said, in proposing a vote of thanks to Dr. Watson, he could not avoid expressing his opinion that it was most important for the interests of India that this investigation should be further pursued. Dr. Watson had only got a certain way, although it was astonishing the amount of work he had accomplished in the few months during which he had been employed in these researches. It would be a great boon to India to continue the experiments so well begun. It was not always the case, that if the palate appeared to indicate that certain things were suitable, they could always follow the dictates of nature, because large bodies of men had no choice of food. This was especially the case with soldiers and sailors, and in our workhouses and prisons. Large masses of the people lived upon dietaries arranged by government, and there never was a more remarkable instance of the effect of a want of knowledge of these subjects—than was shown in the dietaries of our prisons, where men received an amount of nitrogenous matter in their food, varying according to the periods of confinement, and not according to the work that they had to perform in prison. The arrangement of dietaries by government ought to be made according to the last discoveries of science. Although there were still difficulties in the question, they knew sufficient to regulate those matters much better than was done at present. He hoped Dr. Watson would receive encouragement from the public, and from the East India Company, to continue these valuable researches, and that he would not find it necessary to give up so useful an inquiry in order to attend to his military duties. He begged to propose a vote of thanks to the author of the paper.

A vote of thanks to Dr. Watson for his paper was then passed.

In returning thanks, Dr. WATSON said there was one fact mentioned by Mr. Riddell, of the greatest importance—namely, the successful cultivation of the gram in this country, which in course of time might supersede the various expensive products now received from Egypt. He thought the hint thrown out by Mr. Riddell ought to be taken advantage of, as he felt confident an admixture of the gram with other food for horses, would produce a better diet than was at present used.

The Secretary announced that on Tuesday evening, the 1st of December, at seven o'clock, a Special General Meeting of the Society would be held, to which Members only would be admitted, and that at the Ordinary Meeting on Wednesday evening next, the 2nd of December, a Paper, by Mr. Apsley Pellatt, "On the Relative Heating Powers of Coal and Coke, in Reference to Economy in Fuel and the Smoke Nuisance," would be read.

SILVER IN SEA-WATER.

By PROF. S. BLEEKRODE.

In the early part of this year Professor Faraday related to the Royal Society the experiments of Mr. Field respecting the presence of silver in sea-water. That silver could be detected in sea water had already been shown by Malaguti, Durocher, and Sarzeau. Their calculation was that it contained 0.0000001 per cent. They detected one milligramme in a hundred litres of salt water from the canal at St. Malo, and also in the ashes of seaweeds: in the *Fucus serratus*, 0.00001, and in *Fucus ceramidæ*, 0.0000001 per cent. of silver.

From the solubility of chloride of silver in chloride of sodium (sea salt), Mr. Field suggested that the silver in that form was dissolved in sea-water, and would be deposited upon copper or yellow metal by the known galvanic reaction. He also observed that that would be likewise the case with the sheathing of ships. Mr. Field analysed 6,000 grains, and found in one case the amount of silver to be 10oz. 2 dwt. 15 gr. Tr. per ton, or 35.326 grains per 1,000 kilogs., and in the other 7 ozs. 13 dwt. 1 gr. Tr. per ton, or 238.006 grains per 1,000 kilogs. I have analysed two different portions of yellow metal, being the worn-out sheathing from Dutch ships in the East Indian trade. The quantity analysed was 1 kilog. (= 2 lbs. 8 oz. 3 dwt. 0.3 gr.) in both cases. The result was:—341 grains per 1,000 kilogs., and 271 grains per 1,000 kilogs. The amount of silver will not be constant, because the sheathing is covered with sand, lime, and other materials, and these cannot be separated without some chance of loss. This communication may possibly confirm the observations of others.

SMOKE CONSUMING FIRE-PLACE.

A smoke-consuming fire-place for ordinary purposes in dwelling houses has been invented by M. Touet Chambor, of Paris. The fire-place consists of a plate of cast iron, bent over at the top at one-third of its height, and surrounded by an iron frame similar to that employed in ordinary fire-places. Attached to this is a cast-iron basket, in which the fuel is placed. The back of this basket is furnished with vertical bars, through which the products of combustion pass into a chamber in the chimney at the back of the grate, the fuel burning with a descending current and the smoke being thus burnt or consumed. In the chamber at the back of the grate is placed a system of tubing, one end of which communicates with the open air, the other with the room to be

warmed. The heat from the fire, being conducted over this tubing, warms the air in its passage through it into the room. At the back of the vertical bars an iron plate slides up and down, so as to regulate the amount of opening into the chamber at the back and thus increase or diminish the draft. In the upper and bent portion of the iron plate are two openings into the chimney with sliding doors or registers. These registers, in conjunction with the sliding plate at the back of the fire-place, assist in regulating the draft through the fire and over the tubing. By lowering the sliding plate and opening the register above, the grate becomes at once an ordinary open fire-place, the flame and smoke ascending through the chimney in the usual way. By closing the upper register, partially or wholly, as may be found necessary, and raising the sliding plate, the action of the draft becomes at once reversed, the smoke is consumed, and in addition to the radiated heat from the open fire, the play of the flame and heated gases on the tubing causes warm air to pass into the apartment. This tubing, from its size and length, and the continued flow of cold air through it, is kept comparatively cool, and though made of thin sheet iron is stated never to get over-heated, and is thus preserved from destruction. The fire-place is adapted to burn wood, coal, coke, and every variety of fuel. It is not easy to give a very intelligible description of this fire-place without diagrams, but if any member of the Society desire further information, the Secretary will be happy to place them in communication with M. Touet Chambor, who is now in London, and will show the stove in action.

Proceedings of Institutions.

MACOESFIELD.—The twenty-second annual meeting of the Useful Knowledge Society, was held in the Town-hall, on Tuesday evening, Nov. 10, when prizes were awarded to the most successful students in the various classes. Samuel Greg, Esq., one of the vice-presidents of the Society, occupied the chair, in the absence of the president, J. Brocklehurst, Esq., M.P. On the platform were—the Mayor (F. Jackson, Esq.), the ex-Mayor (W. Bullock, Esq.), C. Egerton, Esq., M.P., Rev. W. C. Cruttenden, Rev. W. R. B. Arthy, Joshua Fielden, Esq., of Todmorden; Mr. T. U. Brocklehurst, Mr. C. Brocklehurst, Mr. John May, and Mr. Potts. The room was well filled. The Chairman, after addressing the meeting, called upon the Honorary Secretary to read the report of the Committee. One of the first subjects to which their attention had been drawn after their election to office, was a revision of the rules of the Society, and in the performance of this duty the Committee availed themselves of all the information they could obtain from the rules of similar Societies in other towns, and they have thus been enabled, after much labour and mature consideration, to frame and submit to the members a new set of rules and regulations, which they believe are applicable not only to the present position of the Society, but also to any varying circumstances which may hereafter arise. The Committee much regret that the readings and lectures during the past year have been so scantily and poorly attended, and that they have therefore been obliged to decline making any new engagements with lecturers. The classes, however, continue to be well and diligently attended, and the progress of the pupils, both male and female, (as is shown by the teachers' reports,) has been and is still most satisfactory. With respect to the library, the Committee report that they have increased it by the purchase of about 200 volumes, in addition to several donations. The number of volumes issued during the past year has been about 13,300, and in this issue, the more solid and instructive works have borne a just proportion. The Committee have much extended the utility of the News and Read-

ing-rooms by the introduction of additional newspapers and periodicals. Special thanks are due to E. C. Egerton, Esq., M.P., for a donation of £50, which, with another £50, part of the last year's balance in the hands of the Treasurer, has been applied in reduction of the debt on the Society's premises. The Committee also thank Mr. Egerton for a donation of £5 5s. for prizes for the pupils, and for his promise of annually repeating this donation. After the reading of the report, Mr. Egerton addressed the meeting, and was followed by Mr. T. U. Brocklehurst. The distribution of the prizes to the successful students then took place, the Chairman and Mr. E. C. Egerton taking part in the proceedings, and addressing a few words of commendation and encouragement to the several recipients. The reports of the class teachers were then read, which shewed that the classes had been largely and diligently attended. The meeting was afterwards addressed by Mr. Greg, the Mayor, Mr. John May, the Rev. W. R. B. Arthy, Mr. Joshua Fielden, the Rev. W. C. Cruttenden, Mr. Potts, Mr. Charles Brocklehurst, Mr. Wright, Mr. Bullock, Mr. Jesper, and Mr. Curwen. After passing the usual votes of thanks the meeting separated.

NAILSWORTH.—The present session of the Literary and Mechanics' Institute was inaugurated by a soiree, which took place on Tuesday, the 13th October, at the Nailsworth Subscription Rooms. Mr. J. E. Barnard, who has been president of the Society from its commencement, having resigned that post, the opportunity of the opening festival was taken to present him with a testimonial,—a handsome silver inkstand, subscribed for by the whole body of the members. M. H. Whish, Esq., the President of the Institute, occupied the chair; and the room was well filled. The Chairman commenced by referring to the loss of Mr. Barnard as their president, and to the removal from the neighbourhood of one of their most active supporters, Mr. Anstie. They had to congratulate themselves on the fact that though the novelty of the institution had passed by, yet the Society still held its own. It was very much the case that institutes which flourished at first, languished after a little time when their first and principal supporters died and fell away; but they had kept on very well, and had more than balanced their expenditure by their receipts. It was a matter of satisfaction that several gentlemen and ministers of the neighbourhood had given them their countenance, and favoured them with lectures. Mr. Sibree was then called upon to address the meeting. Mr. Whish had put into his hand a subject on which to speak,—Free Discussion—its influence on the national character. He feared that an important branch of their Society—the discussion class—was not in so vigorous a condition as formerly. Free discussion had an important influence on the national character. Without the discussion of principles, no great advance would be made in any branch of knowledge. It had been said that man is naturally a contentious animal, and Hobbes had affirmed that the natural condition of mankind is war. He believed that to a certain extent that was true, though it should be a war of discussion, of opinion,—that war whose issues are in truth, and in all the great advantages which are connected with truth. Free discussion might be conducted with very little profit, for discussion should always be founded upon knowledge. It ought to lead to knowledge, and if it did not, it was of comparatively little value. Referring to the Indian question, he thought that the members should more especially cultivate those branches of knowledge connected with that subject. There would come a time—and that not far distant—when the subject would be thrust upon their attention, and they would have many facilities during the winter to study its bearings and interests. In presenting the testimonial to their late president, Mr. Bruton referred to the past history of the Institution. He remarked that those who had invested money in the building ought to be satisfied with the happy sight they then and at other times witnessed, &c.

accept that as a sort of interest for their investment. He concluded by referring to the great services that Mr. Barnard had rendered to the Institution. That gentleman then returned thanks, and said their success was mainly attributable to the unity and cordiality always exhibited amongst the members of the society. The meeting was afterwards addressed by the Rev. E. N. Maugin, Mr. Lyceot, Mr. W. Barnard, and other gentlemen, and concluded by passing a vote of thanks to the Chairman.

MEETINGS FOR THE ENSUING WEEK.

- MOX.** Royal, 4. Anniversary.
ACTUARIES. 7. Mr. Willich. I. "On a New Formula for the Expectation of Life." II. "On the Value of Life Annuities yielding a given Rate of Interest, the Capital to reproduce the Purchase Money being invested at another Rate."
ARCHITECTS. 8. Mr. W. A. Bouleau, "On the Foundations of some of the Metropolitan Bridges in the River Thames."
TUES. Society of Arts, 7. Special General Meeting.
CIVIL ENGINEERS. 8. Renewed discussion on Mr. Moleworth's Paper, "On the Conversion of Wood by Machinery." Mr. T. S. Sawyer, "On Self-acting Tools for the Manufacture of Engines and Boilers."
PATHOLOGICAL. 8.
WED. Society of Arts, 8. Mr. Apsley Pellatt, "On the Comparative Heating Powers of Coal and Coke, in regard to Economy of Fuel and the Smoke Nuisance."
GEOLOGICAL. 8. Mr. H. D. Sorby, "On the Structure of Crystals, as applicable to the Determination of the Aqueous or Igneous Origin of Minerals and Rocks."
THURS. Zoological, 3.
ANTIQUARIES. 8.
CHEMICAL. I. Dr. Muller, "On Rosolic Acid." II. Mr. F. Field, "On the Arseniates of the Earths."
LINNEAN. 8. I. Mr. Garner, "On the Shell-bearing Molluscan Animals, particularly with regard to Structure and Form." II. Mr. Cobbold, "General Observations on *Entozoa*, with notices of several new species, including an account of *Tania serrata* and *T. cucumerina*." III. Mr. Slater, "On the Fauna of New Guinea."
PHILOLOGICAL. 8.
PHOTOGRAPHIC. 8.
SAT. Asiatic, 2.
MEDICAL. 6.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, November 20.]

Dated 8th October, 1857.

2552. James Coombe, Belfast—Improvements in machinery for hacking and preparing flax and other fibrous substances.
 Dated 16th October, 1857.

2648. David Guthrie and Joseph Vavasseur, New Park-street, Southwark—A machine for cutting, chipping, or rasping dye-woods or other similar fibrous substances, for the purpose of obtaining extracts.
 Dated 21st October, 1857.

2666. Robert Clerk, Glasgow—Improvements in effecting the consumption or prevention of smoke, applicable to steam boilers and other furnaces.
 Dated 22nd October, 1857.

2664. Marc Antoine François Mennons, 29, Rue de l'Abbaye-Montmartre, Département de la Seine, France—Certain improvements in machinery for the preparation of peat. (A communication.)
 Dated 24th October, 1857.

2708. James Thom and Hugh McNaught, Glasgow—Improvements in looms for weaving.
 Dated 4th November, 1857.

2797. Richard Laming, Hayward's Heath—Improvements in purifying gas and in apparatus useful for that purpose.

2799. Francis Higginson, Woodlands-cottage, Woodlands, Hants—Submerging, extending, and laying down submarine, electric, magnetic, and every other description of submerged or immersed electrical telegraph cables, wire ropes, and combined wire, gutta serena, spun-yarn, or other compound electrical cables whatsoever.

2801. Romain Ignace Charles Dubus, Brussels—A method of treating certain plants or vegetable substances, in order to extract from the same, 1st, a kind of *Acoula* or *faria* proper both for alimentary and finishing or starching purposes; 2nd, an alcoholic liquor; and 3rd, a natural ferment or yeast.

2803. Charles Clay, Walton, near Wakefield—Improvements in machinery for grubbing or cutting up weeds and otherwise scarifying and cultivating land.

2805. Joseph Miller, Alpha-road, Regent's-park—An improved arrangement of marine steam engines.
 Dated 5th November, 1857.

2807. Joseph Bunnett, Deptford—Improvements in machinery for banding and shaping metals.

2809. George Robinson, High-street, Deptford—Improvements in apparatus for shelling or hulling coffee and other berried seeds.

2811. John James Cousins, Park-lane, Leeds—Improvements in the construction of steam ploughs.

2813. William Sharman, Sheffield—An improved metallic compound, applicable to the manufacture of useful and ornamental articles for which German silver and compounds resembling German silver are at present used.
 Dated 6th November, 1857.

2815. Frederick Lipscombe, Strand—Improvements in the mode of conveying water and other liquids.

2817. Germain Canouil, Paris—Improvements in the manufacture of matches.

2819. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of malleable iron and steel, and also in the manufacture of railway bars, and other bars, plates, and rods from iron or steel so manufactured.
 Dated 1th November, 1857.

2821. Hugh Baines, Manchester—Improvements in machinery or apparatus for the prevention of accidents, applicable to hoisting and other lifting machines.

2823. John Henry Pepper, Royal Polytechnic Institution, Regent-street—Improvements in displaying various devices and revolving discs or surfaces are used.

2825. William Wilson, 1, Canterbury-place, Newington, and James John Joseph Field, 11, Sussex-street, Wandsworth-road—Improvements in casting or moulding liquid and other substances.
 Dated 9th November, 1857.

2827. Walter Hardie, 6, Pitt-street, Edinburgh—An improved stereoscope.

2829. Pier Alberto Balestrini, Brescia, Italy—Improvements in machinery and apparatus for paying out submarine telegraph cables, and for regulating and controlling the paying-off thereof.

2836. George Weedon, Gloucester-place, Portman-square, and Thomas Turner Weedon, Plumstead—An improved mode of aning machine.

2835. John Reeve, 46, Rutland gate—Improvements in propelling vessels.
 Dated 10th November, 1857.

2837. Thomas Rowcliffe, 24, Upper Park-place, Dorset-square—Improvements in machinery for making and pressing brick, drain pipes, and tiles, and in preparing material to be used for such like purposes.

2839. Joseph Townsend, Glasgow—Improvements in the manufacture or production of sulphurous acid.

2841. John Thomas Way, Welbeck-street, Cavendish-square—Improvements in obtaining light by electricity.

2843. Henry Critchett Bartlett, Amphill-square, Hampstead-road—Improvements in the manufacture of paper.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2846. Edward Halliday Ashcroft, Manchester, U.S.—An improved mode of preventing the over-heating and bursting of steam boilers. (A communication.)—11th November, 1857.

2879. John Gedge, Wellington-street South, Strand—Improved means for stopping or retarding carriages used on ordinary roads. (A communication.)—17th November, 1857.

WEEKLY LIST OF PATENTS SEALED.

November 20th.

1423. James Abbott, jun., Richard Handley Thomas, John Young, and James Edward Hunt.
 1424. Joseph Jakens.
 1424. William Todd.
 1458. William Carron.
 1458. Thomas Humphrey Roberts.
 1459. Thomas Silver.
 1460. Gaudier Olivier de la Barre.
 1461. John Phillips.
 1478. William Scott Underhill.
 1896. William Wright.
 1834. Alfred Vincent Newton.
 2336. Frederick Albert Gatty.
 2508. Rudolph Bodmer.

November 24th.

1464. William Robertson.
 1489. Robert Parkinson and John Standish.
 1491. William Irlam Ellis.
 1492. Henry Crompton.
 1497. Jean Leonard Codet-Négrier.
 1499. Randal Crosswell.

November 26th.

2423. William Lov.
 2442. George Tomlinson Bousfield.
 November 17th.
 2440. Edward Belmer.
 2451. Henry Diaper.
 2450. William Beasley.

November 24th.

1502. Richard Archibald Beauman.
 1509. Richard Edward Hedge.
 1509. William Hale.
 1516. Alexander Simpson.
 1516. William Wilber.
 1521. James Merryloes.
 1555. James Stevens.
 1562. William Jones.
 1567. John Jobson.
 1579. Richard Roberts, with Shaw, and Samuel Shaw.
 1599. Alfred Jean Vincent Duguet.
 1805. William Wright.
 1830. Arthur Dunn.
 1836. George Farrell Ramsey.
 1842. Joseph Mitchell Pavia.
 1841. William Edward Norman.
 1692. Salomon Sturm and Hans Emile Bour.
 2182. Peter Carmichael.
 2350. John Penn.
 2365. Thomas Brown.
 2392. Henry Rawson.
 2407. Emile Aloin.
 2451. Daniel Forrester.

November 26th.

2423. William Lov.
 2442. George Tomlinson Bousfield.
 November 17th.
 2440. Edward Belmer.
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Journal of the Society of Arts.

FRIDAY, DECEMBER 4, 1857.

SPECIAL GENERAL MEETING.

TUESDAY, DECEMBER 1st, 1857.

A Special General Meeting of the Society, was held on Tuesday evening, the 1st inst., at seven o'clock.

Mr. C. WENTWORTH DILKE, chairman of the Council, said, that it appeared to his colleagues and himself, that it would be more becoming on this occasion, when undoubtedly the conduct of some of the Members of Council might be considered to be under discussion, to place in the chair some member unconnected with either side. He should, therefore, before he sat down, propose a gentleman whose name would, he believed, be satisfactory to all. Mr. Dilke said he had been instructed by the Council to have before him the Minutes of Meetings of Council, and of the Board of Examiners and other Committees, in case the chairman or any gentleman might wish to have them referred to. The Council had also invited the representatives of the Press to be present. Mr. Dilke then proposed that Mr. W. H. Bodkin should take the chair.

This motion, having been seconded by Mr. MATTHEW MARSHALL, was carried unanimously.

Mr. BODKIN, having taken the chair, said, it appeared to those who felt it to be their duty to call the meeting that it was desirable the chair should be occupied by one who had taken no part whatever in the discussions which led to the meeting. Being an old member of the Society, and feeling desirous to be serviceable to it, he hoped this circumstance would acquit him of what, under other circumstances, might appear presumption. He should endeavour to perform his duty impartially, and if it was a recommendation that he knew nothing of the subject to be discussed beyond what he learned from a hasty perusal of the papers, he possessed that recommendation. He trusted that the discussion would be conducted in a conciliatory spirit, and in a manner in keeping with the character of the Society.

The SECRETARY read the Bye-laws relating to General Meetings of the Society, and those relating to the alteration of Bye-laws, as well as the following advertisement, inserted in the Society's *Journal* and in the newspapers, convening the meeting.

SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

"The Council hereby convene a Special General Meeting of the Members of this Society, to be held on Tuesday, the 1st of Dec., at 7 o'clock, p.m., for the following purposes:—

"1. To revoke the five existing Bye-laws which relate to the Board of Examiners, and to make and adopt other Bye-laws in the place thereof.

"2. To consider the amended and extended scheme of Examinations which the Council propose to carry out in concert with the Institutions in Union.

"3. In compliance with a requisition received from certain members, to take into consideration and decide on the propriety of continuing to hold Local Examinations of the Members of Mechanics' Institutions, and similar societies, and to award certificates of merit accordingly."

"4. And, generally, to pass such resolutions as may express the sense of the Meeting in relation to all or any of the before-mentioned subjects.

"By order of the Council,

"P. LE NEVE FOSTER, Secretary.

"Society's House, Adelphi, London, Nov. 23, 1857."

The SECRETARY produced the notice of the meeting, which, together with a copy of the proposed new Bye-laws,

had been suspended in the Society's room for the required period.

The SECRETARY then read the following report from the Council:—

"The Council consider that it will conduce to the convenience of members to give a brief summary of the points which they have proposed should be brought before the present Special General Meeting.

"The first subject is the legality of the present Bye-laws affecting the Examinations.

"Members will bear in mind that these Bye-laws are new, having been passed as recently as last February; and, during the past month of November, were, for the first time, about to come into operation. The attention of the Council was drawn to the fact, that the Bye-laws were contradictory to the Charter—that they were illegal. That they are illegal, the solicitor of the Society, who is now present, will assure the members if they entertain any doubts upon the subject.

"The Council submit to the members the expediency of passing new Bye-laws. The proposed new Bye-laws simply place the Board of Examiners under the control of the Council, as they were before the Bye-laws attempted to remove them from that control.

"The Council repudiate altogether the slightest intention of disrespect to the Examiners, in suspending their functions in order to prevent an election of them contrary to the Charter.

"The Council place, with confidence, their Programme of Examinations before the members at large."

Mr. EDWARD BAINES said, as president of the Yorkshire Union of Mechanics' Institutions, he had consented to take charge of some memorials which it was now his duty to present. He felt called upon to state that, a report having reached the Institutions which he represented, that the Society contemplated discontinuing the Examinations, a form of petition was agreed upon and sent round to the various Institutions of the Yorkshire Union. He felt necessary to take up the time of the meeting in reading this memorial, though he was sorry to say it was agreed to before they were acquainted with all the facts of the case, and he wished the meeting to know the exact truth as to the circumstances under which this memorial had been signed. Mr. Baines then proceeded to read the following memorial:—

"TO THE SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

"We, the undersigned members of Mechanics' Institutions comprised in the Yorkshire Union, have heard with feelings of deep regret that the Council of your Society have resolved to discontinue the Examinations, and thereby to deprive them of that stimulus to application in class instruction which they had reason to believe would have been continued from year to year; and they were fortified in this opinion from the success which has already been achieved, and which must have fully realised the most sanguine anticipations of all who have taken part in this important movement. Your memorialists are of opinion that no step which has yet been taken to influence the extension of mental cultivation, by means of Mechanics' Institutions, has been so practically beneficial as the stimulus afforded by the Local Examinations of the Society of Arts, and they entertain the most confident belief that the advantage to be gained in the future will be greater than has yet been accomplished, if the examinations be continued, and their usefulness extended by increasing the number of local centres. Your memorialists, therefore, beg respectfully but urgently to entreat that the good work thus auspiciously begun may be continued, and that from year to year they may enjoy the solid advantage of an examination in which the merits of the respective candidates are efficiently tested, and the only practical stimulus given to instruction in the Evening Classes of the several Institutes."

The memorial was signed as follows:—Atkworth!

chanice' Institute, 36; Almondbury, 64; Batley, 142; Barnoldswick, 37; Barnaley, 28; Bingley, 58; Brig-
house, 81; Boston Spa, 10; Calverley, 44; Churwell, 67;
Dewsbury, 57; Dogley Lane, 32; Doncaster, 156; Ec-
cleshill, 36; Gomersal, 144; Halifax, 77; Headingley,
20; Hebdon Bridge, 76; Helmsley, 22; Hepworth, 23;
Holbeck, 41; Houghley, 62; Hunmanby, 12; Keighley,
88; Kirkby Malzeard, 10; Knottingley, 27; Leeds (me-
morial of similar purport), 126; Ditto, East Ward, 101;
Penny, West End, 71; Lockwood, 72; Masham, 29;
Mossbridge, 42; Mossley, 51; Northowram, 71; Pudsey,
114; Redcar, 41; Richmond, 74; Rotherham, 70; Selby,
87; Shelley, 66; Southowram, 44; Thirsk, 49; Tickhill,
54; Wakefield, 70; Wilsden, 36; Woodhouse, 112;—
making a total of 2,784 signatures.

He had also a memorial of the same nature from the Hindlersfield Mechanics' Institution, signed by 459 members. This place, it would be remembered, was selected as the centre of provincial Examinations last year, and from that circumstance peculiar importance attached to that memorial. He thought it only right to state that these memorials were founded upon the supposition that it was the determination of the Council of the Society of Arts to abolish the Examinations altogether. Upon learning the real state of the case, he immediately caused a meeting of the committee of the Yorkshire Union to be convened, by whom the following resolutions were passed:—

4. *Resolved*—That the committee learn with pleasure that it is not the intention of the Council of the Society of Arts to discontinue the Examinations, but rather to extend them as far as possible. The committee, however regret to find that the Council contemplate abandoning the oral Examinations, and propose to conduct the examinations solely by printed questions sent down to the respective Institutions. They cannot but fear that this method will fail of success, and endanger even the continuance of the Examinations:—

3. Forcible examination papers alone, without the assistance of oral examinations, cannot satisfactorily test the effectiveness of the students.

"2. Sooner would the presence of Examiners from the territory of Ariz. state will be a liability to local parties and interests and the Examinations and Certifications will lose much of their importance in the estimation of our audience."

It is desirable that the personal visits of the Examiners to the various schools should serve to excite interest in the efforts and progress of the Institutes, and to vitalise the whole movement.

4. As for the practical side, it seems to exist in the form of "volunteering" and "partially extending the Examination" as it is called, in which they have been found to consist of the selection of the highly competent men without remuneration as Examiners are willing to visit the candidates and the family members funds, derived from the Government, to examine them to remunerate them for their services.

...and I think it their duty to continue until such time as the various exertions of the kind as Japan is making are not exhausting the resources of the country. I think they can do this mainly and, in my opinion, almost entirely at the private interest expense and that the United States is a certain loss if the United States should be left out of the picture."

A. K. RAY, President of the Institution of Engineers, presented the paper on "The Role of the Institution of Engineers in the Development of the Indian Engineering Profession".

The above is a good summary of the facts and the anti-Semitism theory are unable to express them in some appropriate way, so the Society of Anti-Semitism and Anti-Jewish Discrimination. I am glad that it has been informed to make the discrimination in other papers, as it will

enable the Society with ease and facility more widely and efficiently to extend the Examinations. The plan which has been adopted by the Hants and Wilts Adult Education Society, is referred to, and explained in, the following extract from the Society's report, presented October, 1886. There has never been the slightest reason to believe that the Examinations, under these provisions, have not been conducted fairly and honestly :

‘The method of conducting the Examinations was as follows :—An application was made to the president of the Institution to which the candidate belonged, requesting his assistance in the nomination of three members, one or other of whom would be present during the whole of the Examination, and report that the answers of the candidates were given without any aid or assistance whatever. The whole was in writing. Two hours in the evening were fixed upon by the president, and allotted to each paper of questions, which was sent by that day’s post to the president, sealed, and with a special direction on the cover, that they were to be opened in the room. The answers also were to be sealed up in the room, and returned with a certificate from the manager to the secretary by the post.’

“ This plan has the peculiar advantage of bringing home the Examination to each candidate, without cost of time or expense. While venturing to bring their own practice before the Society, the memorialists would wish it to be understood that they state it only for consideration, but that they are ready in every way pointed out by the Society to promote its objects, and to place their services at its disposal. Small local districts may readily be formed, if it be thought desirable, and in this their local knowledge might, perhaps, be available in the two important counties their operations embrace. If, on the other hand, it be determined to conduct the Examinations locally in each Institute, they will willingly undertake to aid in securing fairness and fidelity in the Examinations in all the Institutions in union with the Society of Arts, and the Hants and Wilts Adult Education Society in the district for which they act. While hailing with the greatest satisfaction the measures recently taken by the Universities, they would express an earnest wish that through the recommendation of the Society of Arts, or those friendly to such an extension, the age for the second or higher examination could be extended to 21 or even to 25 years. To render the boon granted by the Universities efficient for the purposes proposed, the extension would appear to your memorialists indispensable, inasmuch as it is intended to include those who, from a variety of circumstances, would never be able to receive a University education, and to whom, therefore, ample time and every opportunity and encouragement should be given to present themselves for Examination.”

THE SECRETARY then read letters enclosing resolutions in favour of the continuance of the Examinations, which had been received from the following Institutions:—Tailor's Labour Agency Literary Institute; Hitchin Mechanics' Institution, deprecating any essential change in the mode of conducting the Examinations; Lewes Mechanics' Institution; Manchester Mechanics' Institution, approving of the system carried out at Huddersfield, and deprecating any change; from the Wenlock Agricultural Reading Society; two letters from the Birmingham and Midland Institute, the first containing a resolution expressing their regret that the Society appears to contemplate the abandonment of the Examinations, and the second acknowledging the receipt of the Programme, and expressing their satisfaction at finding that their apprehensions were without foundation; from the Portland Breakwater Mechanics' Institution, expressing their entire concurrence in the course adopted by the Council; from the People's College, Sheffield, acknowledging the receipt of the Programme, and cordially concurring with the arrangements proposed by the Council.

Mr. JAMES GLAISHER, F.R.S., said, he believed that a letter had been received by the Council from Colonel Sykes, and he was desirous that it should be read to the meeting.

The CHAIRMAN ruled that the reading of the letter would be out of order.

The Secretary then read the Bye-laws proposed to be revoked, as follows:—

XII. THE BOARD OF EXAMINERS.

62. "To carry into operation the system of Examinations established by the Society, a Board of Examiners shall be elected from year to year in manner and form following:—On the first Wednesday in November, in each year, the Secretary shall summon all the members of the Board of Examiners to a meeting, due notice thereof having been previously given; and the members assembled, three being a quorum, shall proceed to nominate the persons whom they propose to be members of the Board of Examiners for the ensuing year. The Secretary shall cause a list of the names, thus proposed, to be printed and sent to each member of the Board, duly summoned, at the same time, to attend a meeting of the Board of Examiners on the second Wednesday in November. The Board of Examiners shall then proceed to select by ballot the persons who are to constitute the Board of Examiners for the ensuing year. No person shall be so selected unless he shall have had a majority of the votes of the persons then present and voting. The Chairman of the Board of Examiners shall certify, under his hand, to the Council the names of the persons so selected to act as the Board of Examiners of the Society of Arts. The list of selected names being submitted to the Council, duly summoned, for confirmation, it shall be competent for the Council to erase the name or names of any of the proposed Examiners from the list; and having confirmed the remainder, and appointed them to be the Board of Examiners for the ensuing year, to require them to proceed to nominate other fit persons to supply the vacancies in the Board of Examiners.

63. "Whenever a vacancy shall from time to time occur in the Board of Examiners, it shall be competent for the Board, duly summoned, to proceed to nominate, in the manner before described, a person to fill the said vacancy; and on his election being confirmed by the Council, he shall be admitted a member of the Board.

64. "Should the Council at any time, on the representation of the Board of Examiners, think proper to increase the number of Examiners, the election shall take place in the manner before described.

65. "The Board of Examiners shall elect a Chairman on the third Wednesday in November. He shall be elected by ballot. The Chairman of the Board of Examiners shall, *ex officio*, be entitled to be present at all meetings of the Council, and shall be duly summoned thereto.

66. "The Board of Examiners shall not vacate office with the Council, Officers, and Committees annually in June, but shall continue to hold office until the appointment of the succeeding Board in November.

Mr. HARRY CHESTER said, he had been requested by his colleagues in the Council to move the first resolution, and he would endeavour to do so without heat and without personality. As far as the Council and himself were concerned, they desired the discussion to be confined as strictly as possible to the business before them. The present meeting had been convened for the purpose of considering the expediency of repealing the five existing Bye-laws relating to the Examiners and substituting four others in their place; also to consider the Programme of Examinations which the Council had issued, and to take into consideration a requisition which had been received from Institutions in the North; and to pass such resolutions upon any or all of these matters as the meeting deemed proper. He begged to state at the outset that no question as to the continuance of the Examinations had ever been raised by the Council. They were obliged, under the Bye-laws, to include that subject in the notice for this evening's meeting, inasmuch as a requisition duly signed had been sent in to that effect; but if that question were put to the meeting, the Council, he need hardly add, would unanimously vote for it. It must be evident to all who had heard what had taken place, that a very large amount of misapprehension had prevailed as to the proceedings and the intentions of the Council in this matter, and he was glad to have heard the explanations with which Mr. Baines introduced the memorials he had presented. The only resolution which

the Council had to propose was that of the revocation of Bye-laws which they believed to be illegal, and the substitution of others which they considered to be in accordance with the Charter of the Society and suited to its present circumstances. The Bye-laws, which they proposed to revoke, had been read, and those which they proposed to substitute he would read, in formally proposing their adoption. The first point was, as to the illegality of the existing bye-laws, and this the honorary solicitor of the Society, who was present, would certify. He could with truth say that this matter had been carefully investigated at several Council meetings, attended by larger numbers than usual. It was no doubt true that upon paper there were thirty-five members of the Council. This number included H.R.H. the Prince Consort, who was President of the Society; the Marquis of Lansdowne, and other men of high position; but he need hardly say those gentlemen were not in the habit of attending the meetings of the Council. During the whole period that he had been connected with the Council, he never remembered any subject that had been dealt with at so many and such numerously-attended meetings of that body; and it was a remarkable fact that those members of the Council who had voted upon any of the questions now under agitation had throughout been unanimous in their opinions. Therefore, in speaking in the name of his colleagues, he gave the result of the unanimous decision of those who had attended the meetings. The Council found that they were placed in circumstances of great difficulty. Their attention had been drawn to the fact that these bye-laws were in opposition to the terms of the charter, and therefore illegal. The Council, on two or three occasions, discussed that question, and came to the conclusion that these bye-laws were illegal, and in that conclusion they were fortified by the opinion of their legal adviser. The Chairman of Council, in his address at the opening of the present session, had stated generally the grounds on which the illegality rested—that, inasmuch as the charter vested the entire management of the Society in the Council, the existing bye-laws made the Board of Examiners an independent body, with power to prolong their existence when the Council and all the other officers had ceased their functions; with power to fix their own numbers; to nominate themselves, and to give to the chairman of the Board (who need not be a member of the Society) the right to attend all the meetings of the Council. He thought there could scarcely be a gentleman present who was of opinion that such laws could be maintained; and if they could not be maintained, then what was the plain duty of the Council under the circumstances in which they were placed? The proper course, if time had allowed it, would have been to call a general meeting of the members, and ask for an amendment of these laws, but there was no time for that. The occasion on which the Council met, was on the Friday previous to the second Wednesday in November. On that day the Board of Examiners had to nominate their successors. They had already put in nomination sixty-three persons whom they proposed to ballot for election, and if the Council had allowed the election of those gentlemen to have been completed, all of them would have been placed in a false position. The Council, moreover, had reason to know that an attempt was being made to create hostility between the Board of Examiners and the Council. The Board had themselves allowed that their functions had come to an end for the year, and on that ground had declined to comply with the request of the Council, to furnish them with a scheme for conducting the Examinations on the plan proposed by the Council, alleging that they were so near the end of their term of office and would not fetter the action of their successors. The Council therefore found that the only course open to them was to suspend the existence of the Board; but at the same time they distinctly expressed, by letter to each individual examiner, their intention

renewing the Board as soon as they had received power from a general meeting, and as soon as they could do so in conformity with the terms of the charter. They therefore called this meeting together at the earliest time possible. They were surprised at the report which had gone abroad that it was their intention to suppress the Board of Examiners permanently, and to give up the system of Examinations. So far from their giving it up, the question had never been raised in the Council; notwithstanding this, circulars had been sent to the Institutions making the assertion that the Board of Examiners had been suppressed, and creating an agitation against the Council. In these circulars, which were signed by Mr. Brewer, who was not even a member of the Society, but a candidate for election as a member, it was stated that a meeting of the late Board of Examiners had been held, though this was not the fact, as several leading members of the Board—he knew of six—had not been invited to attend, and gentlemen who had never been appointed Examiners were invited. He confessed his great surprise that such a course had been adopted. All that the Council desired was to bring the Board of Examiners into harmony with the constitution of the Society. The Council desired to treat the Board of Examiners with every respect; they entertained the highest sense of the services they had rendered; but whilst the Council were entrusted with the management of the Society's affairs, they could not consent to an *imperium in imperio* of that description. He trusted the time would never come when the Council would submit to the dictation of any body except the general body of the members, to whom alone they were responsible. The Bye-laws which he had to propose in substitution of those now existing were as follows:—

XII.—THE EXAMINERS.

“To carry on the system of Examinations which the Society has established for the students of the Institutes in union with it, the Council shall, as soon as possible, appoint a Board of Examiners for 1858, and shall hereafter, at their first meeting after the annual general meeting in June, or as soon afterwards as may be, appoint a Board, or Boards of Examiners; and the Council shall have full power to fill up vacancies therein, and to enlarge, reduce, or otherwise vary the number of the members thereof.

“Every such board for the time being, and from time to time, shall have power to appoint one of its own members, being a member of the Society of Arts, to be chairman of such board.

“The Council may make such payments as they shall deem meet, to those Examiners who shall set the Examination questions, and pass judgment upon the answers; but no such payment shall be made to any Examiner being a member of the Council.

“Whenever it shall appear to the Council that any Examination, commenced by a Board of Examiners, cannot be properly concluded, and the awards made by that Board, before the period at which its existence would naturally be determined, viz., at the annual general meeting in June, the Council shall report the same to that meeting, and the meeting may at once re-appoint the said Board, and resolve that it shall continue in existence till its work is done, or till the new Council shall otherwise provide for the same.”

The first of these bye-laws simply placed the Board of Examiners under the authority of the Council. The Council had determined, in obedience to the resolution of the last general meeting, to give up the Examination of the pupils of private schools. Schools were carried on commercially, and the Society of Arts had no means of distinguishing between the most respectable school and the veriest Dotheboys Hall. The Society of Arts must not attempt to set itself up as an educational Society or as an university. It was an Institution for the Encouragement of Arts, Manufactures, and Commerce, and it was upon that basis they desired to proceed. To set up the Society as a great university would only bring ridicule upon it. He was glad to see that there was not likely to be much response to the sentiment that had been expressed that the Society of Arts was defunct. The only basis upon which the

Society could do anything was that which the charters laid down—the encouragement of Arts, Manufactures, and Commerce. There were about 350 Societies in Union with them, and they were entitled to examine the students of classes in those Institutes. The second of the proposed bye-laws would give the Board the power of nominating its own chairman, and they inserted the proviso that the Chairman of the Board of Examiners should be a member of the Society of Arts. The next bye-law was to enable the council to remunerate the Examiners for their services. He believed that the members of the Society were hardly aware of the great extent to which the Examiners had given their services gratuitously. They had not merely undertaken the work of examination, but had met after time and week after week. The council was of opinion that the Board of Examiners should not be an executive body—that the council and its officers should conduct the business connected with the Examination. The work of the Examiners ought to be confined to the setting of Examination papers, and passing judgment on the answers. He hoped the meeting would not send their minds to be prejudiced by the memorials which had been sent up from Institutions in the country, under a misapprehension of the true state of the case. Mr. Baines, directly he found out that the Institutions of which he presided had been misled, and that the intention of the Council was not to give up the Examination but merely to make some alterations in the mode of carrying them on, took the earliest opportunity of setting them right; nevertheless, this misrepresentation had been circulated with great industry. Circulars had been sent to all the Institutions in connexion with the Society, leading the Institutions to believe that the Society was going to give up the Examinations. A circular which he had before alluded to, signed by Mr. Brewer, and dated King's College, London, 16th November, 1857, had been put into his hands. This circular was issued after the Council had, in the most positive manner, stated that there was no foundation for the impression that they intended to give up the Examinations. The writer was, moreover, not a member of the Society, and it seemed strange that a gentleman in the position of a candidate for election, should issue such a circular. Without calling at all in question that it would be expedient to have oral combined with written examinations, if it were possible, the Council having most carefully considered the subject, was of opinion, and at one time in the present year the Board of Examiners was unanimously of opinion that it would be necessary to give up oral examinations altogether. The Council, with the exception of the late chairman, had, after most careful consideration, arrived at the unanimous opinion that oral examinations could not be carried on satisfactorily at a sufficient number of places, that it was impossible to provide against the enormous expense of carrying out that system in a manner satisfactory to the Society. It was mocking the different institutions throughout England, Scotland, Wales, and Ireland, to take their men from them, to offer to examine their students, and then to confine the examination to a few centres. The Council now invited the local authorities to take a larger share of responsibility and authority in the management of the examinations. Examinations by papers might be held anywhere. Any member of an Institution in the most however distant—however poor, however humble, his attainments—might now be made to feel the stimulus of the examinations of the Society of Arts. The local boards could examine orally, but it would be impossible to carry out that plan by Examiners sent from the Society. The meeting would gather from the programme that those persons who, having passed a previous examination, seemed to the authorities of the local boards to possess attainments which would make it expedient for them to enter into the larger competition, would have the

names sent up to the Society; the Society would examine them, and award prizes and certificates to the most deserving. The Council heartily rejoiced in the movement at the two universities, and having no sympathy with those who decried them, had proposed to give certain assistance to persons who, by distinguishing themselves at the Society's Examinations, might give reason to hope that they would be able to obtain the new degree of "Associate in Arts."

Mr. J. GRIFFITH FRITH seconded the motion.

Mr. TOOLE, the honorary solicitor of the Society, in reply to a question, said that he had no doubt whatever as to the illegality of the Bye-laws sought to be rescinded, and had not considered it necessary to take the opinion of Counsel on the subject.

The SECRETARY then, at the desire of the meeting, read the portion of the Charter relating to the powers and duties of the Council.

Mr. BAINEs said he wished to know whether the carrying of the resolution was intended to involve the approval of the whole of the plan in opposition to that already in existence.

Mr. CHESTER said that the passing of the Bye-laws would merely give to the Council for the time being the power of appointing a Board of Examiners to carry on the business, but would in no way fetter any expression of opinion on the part of the meeting in reference to the mode of conducting the Examinations.

The CHAIRMAN, in putting Mr. Chester's resolution, intimated an opinion that the bye-laws were not only illegal but absurd.

The resolution was carried unanimously.

Mr. BAINEs said, that after the statement of the Society's honorary solicitor that the Bye-laws were contrary to the charter, he did not feel it right to vote in favour of maintaining them, but he conceived that that did not touch the great question relative to the distinction between the two plans of conducting the Examinations in Mechanics' Institutes. He entirely concurred in Mr. Chester's remarks relative to the exclusion of the pupils of Commercial Schools from these Examinations; they were in another category altogether from the students of Mechanics' Institutions. Although the numerous memorials presented from Yorkshire did not pronounce a distinct opinion between the two plans, yet it might naturally be concluded that they were in favour of that system of Examinations which they had seen practically at work among them. The oral part of the Examinations was a very essential feature of the system. Without the personal presence and visits of gentlemen from that Society, possessing the weight which men of science, and of public spirit in the metropolis, deservedly held throughout the country, the Examinations would not be carried on in a satisfactory manner. He believed that Mr. Chester had proposed a plan of Examination by written papers at an earlier period, but it was not found to be attractive to the members of the Institutions. On the other hand, there was a plan which had been in successful operation for two successive years, having been first tried in the metropolis only, and afterwards extended to Huddersfield. Entire satisfaction had been expressed at its working by those connected with the Examinations, except in some minor details. In Yorkshire these Examinations were felt to give the stimulus that was absolutely required to the most important part of the Mechanics' Institution, namely, class instruction. The object was to make their evening classes as successful as possible. They wanted to stimulate their young men to study. Dr. Booth had visited their various institutions; he visited them at Leeds—he proceeded to Huddersfield and Middlesborough, and personally introduced that system; and he (Mr. Baines) did not hesitate to express his conviction that if it had not been for the presence of Dr. Booth, and for the zeal and ability with which he had pushed that system of Examinations personally among the members of committees

and teachers of the different Institutions, it never would have come to anything in the North. He should be acting most unjustly to a public man if he did not state that as far as he could possibly judge they were indebted for the actual existence of the plan in operation in the north of England entirely to the exertions of Dr. Booth. He believed it was only by the personal presence of some of the Council amongst them that much could be done; he did not mean to say that without their presence success could not be attained; but the system would be immensely more likely to succeed if the Society sent down Examiners for the purpose of conducting Examinations among them. They would be much more certain of fairness and impartiality if Examiners were sent down from London to conduct the Examinations. There was an undoubted advantage in oral Examinations over Examinations by written questions, in getting at the real attainment of persons under Examination. If there was any case in which written Examinations were not quite satisfactory, this applied to Mechanics' Institutions, many of the members of which, while they possessed high mathematical and mechanical attainments, would be unfairly treated if judged by the answers which they might set down upon paper. He might mention the case of the teacher of the Huddersfield Mathematical Class, who was a plasterer, but who had attainments of so high a character that he successfully conducted a mathematical class, and infused into others that enthusiasm which he himself experienced. He believed that it would do the greatest possible injury to depart from the plan of oral examination, and he therefore proposed the following resolution:—"That, in the opinion of the meeting, it was desirable to continue the present system of Examination, including Oral Examination, by Examiners of the Society of Arts."

Mr. WATTS seconded the motion.

Mr. J. G. CRACE said he considered that education ought to be encouraged, but that there ought to be proper societies to do it. It should not be the Society of Arts, Manufactures, and Commerce that should stand alone in matters of that description. Their funds, their time, their energies, ought to be more worthily exercised in advancing the great objects of their charter.

Mr. THOS. WEBSTER, F.R.S., said, he looked upon the educational movement, or this system of Examination, which the Council had established, as one of those great steps of progress that the Society had been so eminent in carrying forward. He trusted, however, that the Council would not allow themselves to be diverted from the legitimate objects of the Society, and indeed he had no fear upon that point. At their weekly meetings, discussions had taken place upon what were most legitimate objects—Arts, Manufactures, and Commerce. No one would venture to assert that the legitimate objects of the Society had been sacrificed. He thought that no one who had had any experience in education—no one who passed through the universities, who knew how the men there were trained for Examination on paper—no one who knew the character of the men who were to be examined in connection with the Institutions—no one who knew the success of that great educational experiment that was being carried on under the Committee of Council, could doubt that oral Examination was the most valuable adjunct they could possibly have. If practicable, oral Examination ought to be carried out. If Dr. Booth, Mr. Baines, and others, told them it was practicable, he could not but hope that some means might be adopted to give a fair trial to the system.

The Rev. RICHARD WHITTINGTON said, he was the honorary secretary of the Crosby Hall Evening Classes. He most cordially agreed with Mr. Baines in almost everything that gentleman had said, and was most anxious to see the system of oral Examination carried into effect. He agreed with Mr. Baines as to the necessity of having some of the Examiners of the Society present at the Examinations. Without this there ne

days of progress and effort it was a glorious thing to combine these with the furtherance of the cause of education. He endorsed the views expressed as to the value of personal communication with the Institutions throughout the country, and he could not but express his admiration of the course which Dr. Booth had adopted. He had read too many of the addresses of that gentleman not to express the admiration he felt at the energy he had shown in the cause of education. He particularly referred to the late address of Dr. Booth before the Mechanics' Institution of Manchester. In conclusion he begged the Council to pause before they adopted a system which had hitherto worked so well.

Mr. G. F. WILSON, F.R.S., said, having strong feelings in favour of oral Examination, and being connected with two Mechanics' Institutions numbering 150 members, he would, in a few words, state why, as a member of the Council, he had adopted the views of his colleagues in favour of written Examinations. They were the experience of the last year; a very important experiment was then tried. It was not without some difficulty that competent Examiners could be obtained, sufficient for the number of centres then proposed. The Council, carefully considering the matter as men of business, came to the conclusion that they could not extend the system of oral Examination in a way to give real results. They might see it noticed in the newspapers that the Society held Examinations in a great many places, but the results could not have been real. The meeting could not fail to be struck with the remark of Mr. Baines, that even in the very stronghold of Mechanics' Institutions, with all his personal influence there, required all the efforts of the Society thoroughly to organise the Examinations in that local centre.

Mr. CARPENTER, F.R.S., said, having acted as an examiner, and having taken a deep interest in the system ever since its commencement, and having had nine years' experience as an Examiner in the University of London, he thought he could make one or two remarks upon the subject which might help the meeting in coming to a decision upon it. With regard to oral examinations compared to written, his own experience and that of a great many other Examiners had been this—with reference to educated young men, the great value of oral examination was in checking cramming. Dr. Carpenter then referred to some instances coming under his own observation, to illustrate this view. He (Dr. Carpenter) was on one occasion in danger of rejecting a very deserving candidate who failed in written examination merely from nervousness and for want of power to put upon paper knowledge which upon oral examination he was found to possess. He had a very strong conviction that for any perfect system of examination oral in addition to written was an essential element. He, however, appreciated the difficulties in which the Council of the Society found themselves placed; he entered also into the financial difficulties of the question, and the issue seemed to be this:—The Council, if they thought it best for the interests of education, would be prepared to carry out the system of examination upon its first footing, that was, one, in London and one in some other centre, at which oral examinations should be conducted, but he could understand the difficulty of extending the system beyond these two or three centres, and he could enter into the wish of the Council to extend the benefits of the examinations as widely as possible, by giving the opportunity to a large number of Institutions to take a share in them. The question then was this—Was it best for the interests of education, the interests of the Society, and the interests of the Institutions, to have what he must characterize as an inferior and imperfect examination carried on extensively, and to give certificates upon an imperfect system, which would not have the value which the certificates upon a better system would have. What he thought best was to confine the examinations to two or three centres, capable of extension as the funds allowed, but carried

out upon the best possible principle. He could not conceive that any censure would be cast upon the Council by the adoption of either of these two plans. For his part, he was strongly in favour of keeping the Examinations at a high standard, and making them to be felt an honour and a credit. However, he was for leaving this question to the decision of the Council, as they were the persons who were constantly in communication with the various Institutions throughout the country, and were always ready to act in accordance with their views. He believed the Council were best fitted to carry out the objects of the Society, and he should give his support to the amendment which had just been proposed.

Mr. CHESTER did not agree with the gentleman who had said that the carrying of Mr. Baines's resolution would cast a stigma upon the Council. He believed there was no such intention. At the same time, if the resolution were carried, the Council would feel it as a withdrawal of the confidence of the Society. The Council would pay all due deference to the decision of the meeting, but they would regard that resolution, if passed, as a withdrawal of confidence in them. He was not for a moment prepared to contend that after what had passed the Council might not reconsider the subject, but he should mislead the meeting if he held out the hope that the present Council would be able to carry out a system of oral examination by the Society's own Examiners. This subject had been discussed at three meetings of the Council, to the exclusion of any other matter, and after the most careful and painful deliberation, they came to the conclusion, 12 to 1, that it was impossible to carry out the oral examinations. Mr. Chester then referred to the minutes of a resolution passed in February by the Board of Examiners. There were twelve Examiners present, and they passed an unanimous resolution, moved by himself and seconded by Dr. Booth, to give up oral examinations after the year 1857. He did not contend that it would not be desirable to combine the oral with the written, if possible; but he was certain, if this meeting could constitute itself a Council to discuss the ways and means, they would come to the conclusion at which the Council had arrived. A great deal had been said as to the impossibility of carrying on these oral Examinations by the Society in a great number of different places. He was prepared to say they could not carry them on in London alone. If the system succeeded, they would have such an immense number of candidates from London alone, that it would be impossible to conduct the Examination of so large a number orally, considering the time necessary to do justice to each candidate. The friends of education, of whom he was one, must see that there was a feeling among some members of the Society against these Examinations altogether. The Council had given the subject their fullest consideration, and they were of opinion that they could do perfect justice to all the other important objects of the Society, if the programme they had issued were carried out, but they could not do so if the members insisted upon oral Examinations. A part of their plan was, that Examinations should be held previously in the different localities, and in all those localities the Examinations might be conducted orally if it was thought necessary. It pained him very much to hear Mr. Baines—the champion of local authority in education and of the voluntary system—tell them that they could not trust the local bodies to carry out these Examinations. If they could not trust them, then let them give the whole thing up. If the oral system were attempted, it would be impossible for the Society to carry on the Examinations, and the whole scheme would be handed over to the Government. Then the plan which had been before them for the last ten years, in Dr. Booth's celebrated pamphlet, would be realised, and we should indeed see "Examination the Province of the State." What they all desired to see was the development of local authority in education; they wis

wi.

Mr. E. B. DENISON then submitted a motion to the effect that the expenses incurred by Dr. Booth in the printing of a pamphlet issued by him in his own defence should be defrayed out of the funds of the Society. He submitted this motion without any previous communication with Dr. Booth, and wholly without that gentleman's cognizance, and was prompted to do so because the pages of the Society's *Journal* had been closed against Dr. Booth, unless he consented to submit his statement for the approval of the Council, which he could hardly be expected to do.

Dr. BOOTH extremely regretted that such a proposition had been made, and he begged Mr. Denison at once to withdraw it, as he had already paid the expenses of printing his pamphlet.

The proposition was withdrawn.

Mr. TOOKER proposed a vote of thanks to Mr. Bodkin for the very admirable manner in which he had presided over the business of the meeting, which was seconded by Mr. Dilke, and carried by acclamation.

The CHAIRMAN returned thanks, expressing his gratification at the amicable spirit which had characterised the meeting.

THIRD ORDINARY MEETING.

WEDNESDAY, DEC. 2, 1867.

The Third Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 2nd inst., George Lowe, Esq., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Abbott, Edwin Morton	Hastings, George Woodyatt
Adams, James, jun.	Hawkes, Rev. H.
Alkennell, Algernon, S.	Hooper, William
Bakerill, John	Jackson, Edwin Ward
Brooks, Maurice	Jenkyns, Ivan Charles
Bowell, Edward M.	Kendall, Rev. J. H. F.
Brown, Chas. Blakely, M.D.	Kitson, James
Brown, John	Leary, George David
Brown, Rev. Prof. Robert	Levy, William Hanks
Catt, Henry	Manning, John
Charlesworth, John C. D., M.P.	Mewburn, Francis, jun.
Clegg, Thomas	Peover, George
Colquhoun, John Campbell	Ranger, William
Coulton, Isaac Love	Reeve, Charles
Cunningham, Jonah	Roberts, James
Davis, Evan, M.A.	Roupell, William, M.P.
Garraway, George	Rumball, Thomas
Gannett, Elliott	Rumney, Robert
Hall, William Bancks	Sandeman, Thomas G.
Hamilton, Archibald	Seale, Sir H. P., Bart.
Hamilton, William, R.N.	Shout, Thomas Hammond
Hardy, T. Duffus	Vaughan, Edward P. H.
Harris, Alfred, jun.	Wood, John
Harris, George	Woolley, Thomas
	Young, David Alexander

The following Colonial Institution has been taken into Union since the last announcement:—
Swan River Mechanics' Institution, Western Australia.

Previous to the reading of the Paper, the Secretary called attention to some specimens of double and triple salts of Ammonia, Magnesia, Soda, and Potassa, which had been placed in his hands by Sir James Murray. A description of these will be found in the present number of the *Journal*, at page 47.

The CHAIRMAN complimented the author of the paper about to be read, as having for many years devoted his

energies to work out that '*vezala questio*,' the comparative heating powers of coal and coke. He was happy to see around him many who had signalled themselves in this matter of producing the most heat and the least smoke. He would only add that he trusted the discussion of Mr. Pullatt's paper might partake of a practical rather than a scientific character, as, doubtless, one pound of bituminous coal, having all its hydro-carbon saturated with oxygen, must give more heat than the same weight of coke or anthracite, but the facts of daily practice were wanted.

The Paper read was:—

ON THE COMPARATIVE HEATING PROPERTIES OF COKE AND COAL IN REGARD TO ECONOMY AND THE PREVENTION OF SMOKE.

By APSLEY PELLATT.

The coal fields of Great Britain may be considered as the substratum of our commercial wealth, but for this munificent gift of Providence, our manufacturing steam-powers could only, in a limited degree, be maintained.

The abundance of this almost inexhaustible supply of fuel enables us to propel our locomotives, floating batteries, steam mercantile marine, and millions of spinning jennies, mules, &c., in our textile workshops, affording also the means of fusing minerals, metals, &c., and of bringing formerly useless residuum into valuable chemical products.

To enable us commercially to compete with foreign rivals, we should not simply rely upon our abundance of coal and the improved modes of ventilating and working our mines; we should also consider the heating powers of coke as compared with coal, in order to ascertain which is the most effective fuel in reference to economy and reduction of smoke. These are points well worthy of our practical deliberation.

The most striking example of apparent indisposition to reduce the smoke nuisance has been recently exhibited at Manchester, by the dense volumes of smoke almost constantly issuing from her countless tall manufactory chimnies, which so excited the attention and astonishment of strangers on their recent visit to the great Exhibition of Art Treasures. Any person ascending one of those immense manufactories, in expectation of getting a bird's-eye view of the city, would only behold a dense murky floating vapour of smoke. Sheffield, Leeds, Birmingham, Newcastle, and most of the great Northern towns, rival Manchester in impurity of atmosphere and, probably, in wasteful consumption of coals. The southern and eastern localities of the metropolis were worse, in that respect, than the cities of the north, until, by the stringent operation of Lord Palmerston's Smoke Act, metropolitan manufacturers were forced to use coke and other smokeless fuel, or to adopt some smoke preventing apparatus. Any person standing upon either of the bridges of Blackfriars, Waterloo, or Charing Cross, on a fine day, looking up or down the River Thames as far as the naked eye can carry, will notice a much clearer atmosphere than formerly, a convincing proof that owners of steam vessels above bridge, and proprietors of metropolitan manufactories, mills, and breweries, on both sides of the river, by complying with the requirements of the Smoke Act, have succeeded in freeing that part of the metropolis from smoke to a greater extent than most manufacturing towns or cities in England.

It is true that Lambeth (and its potteries) is still a nuisance, greatly complained of by the South-Western Railroad travellers and others, and will, in a great measure, remain so, until the New Smoke Act of 19 and 20 Victoria shall be brought into operation, viz., on the 1st of January next, 1868. Several years prior to the passing of the Smoke Act of 1853, a commission, at the recommendation of the House of Commons, was appointed, consisting of the late Sir Henry de la Beche, and Dr.

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... smoke nuisance in Manchester
... would cease to darken and dis-
... commercial palaces, and handsome
... nothing of injury to curtains and
... park, and the vegetation and foliage of
... of great cities would be much

... the templars, on the Thames, sang
... smoke Nuisance Prevention Act, for
... of his roses, foliage, &c., should not
... extended by the same means to the
... of Salford, and to the manufacturing
... north? Shall it be said that their mer-
... indifferent to the advantages of a purer
... cleanliness and comfort of the work-
... who have already so nobly expended
... in people's parks, public libraries,
... tions, churches, chapels, &c.? Shall these
... be driven into improvement by the ex-
... Metropolitan Act to all the provinces, with
... police to enforce its provisions?

... Commissioners appointed to determine
... site of the National Gallery should be changed,
... "that in regard to atmospheric impurities,
... relation, which had done so much, and may do more
... the metropolitan atmosphere, would probably
... improve its present condition," and who reported
... present site was most advantageous, shall it be
... the magnates of Manchester, whose city recently
... and so powerful a stimulant in the fine arts by its
... recent Exhibition of Art Treasures, that they have
... sympathies in favour of purer air and the reduction of
... smoke nuisance? Is it to be said, in the words of the
... that it is not to

... "be preferred to smoke,
... the Eclipse that metropolitan volcanoes make,
... those Egyptian throats breathed darkness all day long."

... the time has arrived when humanity, art, science,
... philanthropy, should combine to prevent the air in
... manufacturing districts from being longer con-

taminated with volatile, bituminous, discolouring impu-
rities, which in most cases might be turned into profitable
channels of commercial remuneration, and thus improve
the health and wealth of the British nation.

DISCUSSION.

Mr. CHARLES WYE WILLIAMS said, although the author
of the paper had done him the honour to quote somewhat
extensively from the works which he had laid before the
public on this subject, he nevertheless differed entirely
from that gentleman's conclusions on several important
points. Mr. Pellatt had said it was somewhat anomalous
that Newcastle or other bituminous coal, after having
parted with the whole of its bituminous constituents
by coking, to the extent of one-third of its weight, should
give as much calorific effect as coal with the combined
power of bitumen and carbon. Now if the fact were so,
it would be an anomaly, but it was not the fact that coke
possessed superior or even equal heating properties with
coal. The author of the paper had stated that he (Mr.
Williams) explained away this alleged anomaly by showing
the great heat that was lost in the generation of the
gases. It was true he had dwelt upon the loss of heat
in the generation of gas, but he did so to show that
unless they turned those gases to account, they lost all
the heat that was absorbed in generating them. From
these and other circumstances, he thought the author
had not seen the second edition of his treatise, inasmuch
as on several points there was an evident misapprehension
of his (Mr. Williams's) views on this subject. He had
found that even the most scientific men had been often
led into great errors on this question, instancing the case
of Dr. Fyfe, of Edinburgh, who had expended much
laborious research in order to prove that the value of
coal was only in proportion to the quantity of fixed carbon
that it contained. Never was there a more erroneous
idea. The author of the paper had stated that Lord
Palmerston's Act compelled the use of coke instead of coal.

Mr. ARSLEY PELLATT begged to say the Act did not
compel the use of coke, but only that there should be no
smoke from the chimnies of manufactories, leaving the
parties to employ what means they chose to prevent the
smoke.

Mr. WILLIAMS added that in Liverpool the prosecutions
under the Smoke Act were very frequent, and they were
obliged to use coke or anthracite coal; they could not
burn common coal in their furnaces, simply because they
did not admit a sufficient quantity of air into them. A
recent instance of the mistakes into which engineers
sometimes fell, was afforded in the case of the boilers of
the *Leviathan*. He must say they presented the greatest
violations of natural and chemical laws that he had ever
witnessed. He defied them to burn coal in the furnaces
without great waste of fuel and enormous evolution of
smoke, and they must use anthracite coal. The same
remark applied to the *Great Britain* steam-ship. Each
double boiler of the *Leviathan* contained 12 furnaces, and
about 400,000 cubic feet of atmospheric air per hour was
required for proper combustion of the gases alone; but
how was the air to get into the furnaces? It really
seemed as if the utmost pains had been taken to exclude
the air; and to say that the air could be supplied through
the fuel on the grate, was to say that a man could breathe
the air which came from the lungs of another person.
It was an ascertained chemical fact, that a ton of coals
producing 10,000 cubic feet of gas required 100,000 cubic
feet of air for thorough combustion. Prof. Daniel had
even estimated it at double that quantity. Mr. Williams
produced for the inspection of the meeting an apparatus
for indicating the quantity of air that passed into a
furnace.

Mr. FREDERIC PELLATT said, in a question of this kind
facts were better than opinions. In his manufactory for
many years they used small coal in the melting of
the consumption amounting to about 80 tons per

Contrary to the prejudices of himself and his workmen, he was induced to try coke. The stokers asserted that it was impossible to get sufficient flame from it to do the work. However, the experiment was made, and the result of a trial of eighteen months was that they practically got from 13 cwt. of coke the same amount of work as was obtained from 21 cwt. of coal. That was a practical fact within his own experience. With reference to the consumption of smoke, he could not say much; but he believed it depended very much upon the heat at which the air was allowed to pass into the furnace. He had lately seen a new invention for heating the air. It consisted of a double furnace door of thin sheet iron, the two being about 18 inches apart. On each side of the door were five or six shelves, and the air being introduced from below, those shelves served to prevent the too sudden rush of the air into the furnace, and the air was heated and passed into the furnace in a very hot state. There was also a double door at the back of the bridge. He believed the furnace he had described to be quite smokeless and very economical, very much upon the same principle as that adopted by Messrs. Boulton, but more easily applied to ordinary boilers.

Mr. LEE STEVENS ventured to dissent from the general conclusions arrived at by Mr. Apley Pellatt. He wished to remind him that, in his statement that not only would 7 lbs. of gas-coke evaporate more water than 10 lbs. of coal, but that the products of gas, tar, &c., arising from the conversion of the coal into coke, would be of higher value than the original cost of the coal, he had altogether omitted to say what the expense of such conversion would be; it being evident that the contents of the retort could not be acted upon without a corresponding expenditure of fuel, labour, &c., which ought to appear on the other side of the account. As regarded the advantages of the use of coke in certain manufactures, such as glass, he had no doubt whatever, because his own information and experience enabled him to verify Mr. Pellatt's, in relation to the application of heat to melting pots, crucibles, cockles, and small reverberatory furnaces. In a few cases, also, coke might be more beneficially used for small steam boiler purposes; but, certainly, not as a rule. The heat from a coke fire, like that from anthracite coal, was a concentrated and not a diffusible heat, but for large steam boilers of all kinds, in which it was desirable to have the greatest amount of heating surface, gas-producing fuel, (and the more bituminous the coal the better,) by affording the means of enlarging and elongating the flame, must, necessarily, be the most economical and effective. Hence, he was convinced that Mr. Pellatt had come to an erroneous conclusion, from imperfect data, having measured the more universal requirements of furnace work, and particularly for steam-engines, by the experiences of his own glass-house. It should also be borne in mind that, where cast or wrought iron had to bear the concentrated heat from coke or anthracite fires—or, in a lesser degree, from that of the semi-bituminous fuel known in London as the smokeless Welsh coal—very considerably increased destruction of the metal took place. His friend Mr. Macgregor Laird thoroughly tried the use of anthracite coal in a line of steamers between this country and the African coast, but was soon compelled to abandon it, in consequence of the rapid destruction of the steam boilers. He would give, in a few words, some information he had that day obtained at the gold and silver refinery of Sir Anthony Rothschild. There he had applied his regulating air-doors to several furnaces in which the Welsh coal had hitherto been used, but which had since been supplied with a more gas (or smoke) producing fuel. Previously the shields, or fire-door guards, had to be renewed every three or four weeks. Since the alteration the new doors remained without repair for about six months. Before the change of doors and fuel, the wrought iron fire-bars were sometimes melted in a single day, and had generally to be removed every week, but now on the average they lasted a month.

In the crucible furnaces, however, coke was there, as elsewhere, most advantageously used.

Mr. BENJAMIN FOTHERGILL had made a great number of experiments in testing on locomotive engines the relative value of coal and coke for heating purposes. As far as his own experience went, he could say that, wherever contrivances were introduced to effect perfect combustion, comparing coke with coal, the saving was tantamount to one-third in favour of coal. Experiments made on the Belfast and County Down Railway had shown that whilst the cost of taking a train with a given number of carriages from one place to another, with coke as the fuel, was £1 17s. 6d., the quantity of coal required to do the same work cost only 16s. 6d. In applying fuel to locomotive as well as stationary boilers, unless they could avail themselves of the extended flame produced when perfect combustion took place, then, to some extent, the smoke would prove seriously detrimental; and when they carried the unconsumed products of combustion along the main flue, or along the sides of the boiler, the carbon collected upon the surface of the flues, and prevented the heat from acting to the extent it otherwise would do. On the contrary, where they could convert the whole of the products of combustion into flame, and then take them through the main flue and along the sides of the boiler, the results were very much in favour of coal. They ought to take into account the enormous expenditure of fuel for converting the coal into coke; and in judging of experiments such as that mentioned by Mr. Frederick Pellatt, they ought to be informed of the relative cost of the coal and the coke, adding to the latter the cost of fuel for making it. He hoped, on a future occasion, he might have the pleasure of reading a paper before the Society on the subject.

Mr. GREAVES remarked that he was burning not less than 4,000 tons of fuel per annum, and therefore need scarcely apologise for submitting some practical observations. He stated that he agreed, in the main, with the author of the Paper, but he could not go so far as Mr. Pellatt did in his opinion of the advantage of coke fuel. As he desired his observations to be of a practical nature, he would not enter into any theoretical questions, but merely state that the data he would submit were derived from fuel burnt under steam boilers, commonly known as Cornish boilers, with high-pressure steam. The working of the engines was registered daily, by means of counters recording every stroke, and the coal for every engine was weighed daily, and a strict account kept of it. The experiments extended over five years, during which the engines were working under the same load, and in all respects under similar circumstances. The total amount of fuel from which the averages were drawn, was little short of 10,000 tons, and although during the time many minor variations might have occurred, it was assumed that the length of time and largeness of quantity might be fairly considered to have brought these variations to a fair average. The experiments were commenced in 1852, some time previous to the passing of the Smoke Act, and a good average had been obtained of the efficiency of small coal, or slack, which was taken as the standard. Small coal in London was in quality of a rather superior character, being very much composed of the screenings of best coals. Taking this as a standard, the value of other fuel was given in per centage upon it, and stood as follows:—

Woold's Merthyr, advantage in efficiency by weight	23-92
Powell's Duffryn	20-11
Nixon's Merthyr	17-31
Anthracite	12-91
Baich-grove	18-85
Resolven, and others of the softer Welsh coals	5 to 10
Llangennoch	5 to 10
Holywell Main	5 to 10
West Hartley	5 to 10
South Fenrith, and other Newcastle steam-coal	5 to 10

Coke, as generally made by the London Gas Works:—

2,077 tons	...	...	12-98
977 "	...	...	14-62
582 "	...	...	12-36

These numbers were obtained from computations which included the efficiency of the engines as well as the boilers, and were, therefore, only comparative figures; taking the highest, however, as corresponding to 10½ lbs. of water boiled off per lbs. of fuel, the other numbers would all follow in comparison. He therefore did not feel it necessary to supply the additional data for the boiler duty only; it was, however, obtained by measuring the supply continuously into each set of boilers by attaching there a meter which was continuously at work, and was registered every evening along with the engine strokes for the day. The simple efficiency of the fuel under the boiler could therefore be separated from any deranging effects due to the engine. The erection and attachment of a meter was a most useful and inexpensive precaution. An inch meter would supply 150 to 200 horse power of boilers, and need not cost more than £10. The high ratio of 1 gallon of water boiled off per pound of fuel was only to be obtained in constant day and night work; in cases when fires were drawn, banked up, or when the work was interrupted during each night, a reduction of duty occurred to the extent of from 1-6th to 1-10th; 9 lbs. of water for 1 lb. of fuel was a very good result when the work was intermittent, but the scale of comparative efficiency was equally applicable at that rate. The rate of burning at which the above data were obtained, was that of 2½ lbs. of fuel of the better qualities per horse power per hour, 4½ lbs. per square foot of grate per hour, and with a draft pressure of 1-10 inch of water in the flues measured at the front of the side flues. This last test was the best practical indication of the quantity of air taken into the furnace, and was much more easily applicable than a direct machine for measuring that quantity. He had informed the Society of the comparative value of these three fuels—Welch coal, coke, and small coal. In coke itself he was not of opinion that there was any very great difference in the quality of the coke produced by the different Gas Works, provided there was no Cannel coke mixed with it. The coke from Cannel was very inferior, very heavy, and metallic, producing very foul fires, and giving great labour and trouble, and from special trial was found only to produce from ½ to ⅔ the duty of the best quality. The weight of coke was taken at 12 cwt. to the chaldron of 60 cubic feet, dimensions which were settled on exact weighings of large quantities; that bulk a little exceeded the statute size, but was chosen as an even figure. He was in the habit of buying coke always by measure, to avoid the unfair addition of water, the quantity of which that might be absorbed by dry coke was very large indeed, and not only created a loss by the actual weight itself, but as every pound had to be evaporated in the fire instead of in the boiler, it created to that extent a perfect waste of fuel. The limits before mentioned for the rate of combustion were 4½ lbs. per square foot per hour (not less), but these rates were only obtained where slow combustion was carried on. With reference to the question of smoke prevention, he would observe that it should be borne in mind that there were three things to be mixed in a furnace—coal, air, and heat; that is, that it was necessary that a certain quantity of heat should be present in the furnace in which the coal and air had to be mixed. The greater the heat the more easily would the smoke be prevented, and therefore a heavy hot fire allowed a larger quantity of air being admitted to reduce the smoke that would, without it, arise. Great difficulty occurred with slow combustion in avoiding smoke; he had himself failed in his attempts to prevent smoke from Cornish fires. It might be much reduced, perhaps to one-half, by

a large admission of air, but a fall in the duty always accompanied the result. Having more than 16 boilers, all leading to one chimney, of which nine were constantly in work together, he was under the necessity of excessive care, as the united smoke of all the fires soon exceeded parliamentary limits, when any attempt had been made to work bituminous coal. When the rate of burning came up to 10 lbs. of fuel per square foot of grate per hour, with a lower rate of boiling off, or duty, it was more easy to prevent the smoke. As to the objection to sulphur in coke he did not believe it to exist. It had often been said and believed that there was more sulphur in the coke than in the coal it came from, and more sulphur in gas coke than ordinary steam coal. Judging, however, that sulphur was a nuisance to the gas-maker, he rather trusted that he would avoid it for his own sake, and that the coke was less pregnant of sulphur than steam coal generally; he had, at least, long experience to show that no damage occurred by it to boilers, and there was a slight diminution in the destruction of fire-bars; this experience resulted in the use of 650 horse-power of engines and boilers in the establishment under his direction. As to the price of the fuels, the average price of small coal might be taken at 11s. 6d. per ton, the lowest price had been 10s., and the highest 12s. 6d. when buying large quantities; the price of coke was not under 19s., the cost in the trade books for eight half-years standing—20s. 7d., 21s. 4d., 21s. 4d., 19s. 3d., 21s., 20s. 8d., 19s. 5d., 21s. 5d. per ton, after all allowance for ingrain and deficiency. Considerable loss from drying also occurred in all fuel, if kept long in covered stores. By this the above prices per ton had been made higher than the market price of coke at the same time, and these corrections were of essential value; fuel, however, could not be too dry for duty. Mr. Greaves hoped those facts would be acceptable to the Society, being his experience in London fuel, burnt in that ordinary way which he imagined to be the object of the author of the paper to have discussed. The calculations had been made with great care, and were reliable data as averages derived from large quantities. The efficiency of the coke and other fuels, as far as they showed an advantage over slack, must be taken as in abatement of the excess in price, leaving the ton of small coal and the ton of coke, in useful effect when unmixed, as eleven shillings and eighteen shillings, the former with smoke, the latter without. The cost of smoke prevention was therefore seven shillings per ton, on all the fuel so consumed as to comply with the Metropolitan Smoke Nuisance Abatement Act of 1853.

Mr. HYDE CLAKE said, in an establishment abroad with which he was connected, the consumption of coals amounted to about 50,000 tons a-year, at a cost of £2 per ton, including freight. Economy of fuel was therefore, in such a case, a question of the greatest importance. Coke had been tried in the same establishment, but without success. There was a fact which ought not to be lost sight of in this discussion, namely, that, by a proper attention to the system of fuelling, a saving of as much as 10 per cent. could be effected. He thought, in a question of this kind, where everything depended upon the conditions under which the experiments were made, they had not sufficient details at present to enable them to arrive at any definite results. In the instance mentioned by Mr. Frederick Pellatt, it was probably a case of fresh coke compared with stale and badly stored coal.

Mr. WENHAM begged to describe a simple and perfectly effective method of consuming smoke, discovered by Mr. Hugh Mair, of Glasgow. It was not the subject of a patent and did not interfere with existing patents, therefore anyone was at liberty to make use of it. It was applied to a short cylindrical boiler having an interior flue containing the fire place. On both sides of the inner flue there were a number of tubes, below the water-level, for bringing the hot-air and flame be-

again to the chimney which was placed in front. At the further end of the boiler there was a double iron casing, or smoke-box, which covered the end of the fire-flue and return-tubes. Mr. Mair, finding that this double casing became inconveniently hot, drilled a number of small holes through both the plates, with the view of admitting a current of cold air between them for the purpose of keeping them cool. The immediate result was that it became a most perfect smoke-consuming apparatus. The volume of smoke coming from the fire was thus directly met by numerous jets of hot air passing through the end casing, the opposing currents causing an intimate mixture, and a complete combustion of the suspended carbonaceous matter. So perfectly was this effected by this arrangement, that the chimney could not be made to smoke, however bad the fuel (coal) or carelessly the fire might be stoked.

Mr. BLASFELD expressed a wish, looking at the great importance of the question, to hear some further explanation of the plan of furnace adopted by Messrs. Doulton, at their works in Lambeth.

Mr. H. DOULTON remarked that the present discussion had shown that the relative value of coal and coke depended upon the circumstances under which they were used. He was sorry to hear some little discredit thrown upon scientific experiments, and he felt much indebted to Mr. Wye Williams for the valuable light he had thrown upon this subject. He thought they could only arrive at reliable results by following the careful researches of scientific men. With regard to the relative values of coal and coke, as to their heating qualities he could state that during the last four years he used a considerable quantity of coke in his pottery works, and practically he had found it very advantageous, although he agreed with Mr. Williams, that if they could employ the whole of the bituminous products, coal would be immensely superior to coke. But there were practical difficulties in getting the requisite quantity of air at the right time and in the right place. In fact, in a large body of coal they could not get the air to circulate, and an admixture of coke in such cases was an advantage. In building up a fire gradually, coke might be used with advantage in causing the air to circulate through the fuel and promoting the perfect combustion of the whole mass. He would add that the carrying power of coke was by no means equal to that of coal, and the success of the experiments already made depended upon the length of the boilers. He did not think coke could be used in very large proportions by potters, for want of carrying power, but a small quantity might be used with advantage.

The CHAIRMAN, in proposing the thanks of the meeting to Mr. Pellatt for his Paper, expressed a hope that this subject would be taken up at a future time by some of the gentlemen he saw present, who were so well qualified to treat it. The theory of the matter they were all acquainted with; what they wanted was the results of practical experience.

A vote of thanks was then passed to Mr. Apsley Pellatt.

The Secretary announced that on Wednesday evening next, the 9th inst., a Paper, by Mr. S. Sidney, "On the Progress made of late years in the Manufacture of Agricultural Machines and Implements," would be read.

THE SEWAGE OF LONDON.

By HENRY ALLNUTT.

The drainage of the metropolis for the removal of the sewage is so gigantic an undertaking, and involves so great an outlay, that we should not regret the delay that is occurring before a final scheme can be agreed on, as, from the various suggestions that are continually being

made, we may hope at last to arrive at the best method of carrying it out.

As the subject is still under discussion, I beg to offer the following observations:—First, one or two open main drains or channels, of some miles in length, passing through a populous district, must be objectionable; neither is it considered that the mere covering of these long main drains will remove all objections, for poisonous vapour will still be generated from the immense extent of surface, and it will ooze out at all times, especially in warm weather, and during periods when repairs are in progress, and also at the reservoirs. Secondly, the fall (if I understand correctly) of six inches to the mile, for such a thick turbid stream as sewage, I apprehend cannot be considered satisfactory; indeed, from the low situation of the City, and the almost dead level of the river, probably a greater fall cannot be obtained on the margin of the Thames, except by the construction of extraordinary works in a measure regardless of expense. Supposing recourse is had to pumping up the sewage to a higher level, for the purpose of obtaining a better fall, how is it intended to deal with a fall of rain equal to that of the 22nd Oct.? The Registrar-General reports that one-tenth of the total yearly average rain fall for London fell on that day, viz., $2\frac{1}{2}$ inches—being, for the area of London, about 20 millions of tons, or 84 millions of hogsheads. The returns of the Registrar-General show that the amount of rain-fall on this 22nd Oct. equalled the total fall of rain in the month of January last, and nearly that of August last.

A short time ago I visited the sewage works at Watford. No town appears better situated for successful drainage, as it consists of only one street, about a mile in length, with an admirable fall to the works, which are not more than a quarter of a mile distant from the lower parts of the town. But even at Watford, with these advantages of ample fall and short distance, &c., great objections have been urged against the works, and I understood actions at law had been threatened for the abatement of the nuisance.

As the main sewer to the pumping engine is covered, we might feel surprised that annoyance could arise, but I observed an uncovered spot where the odour evidently escaped, which was a small space where a grating was fixed for the detention and removal of paper, rags, skins, hair, &c., obstructions that would soon interfere with and injure the machinery. If, with works so advantageously situated as at Watford, complaints have been expressed, what an outcry might be anticipated with works of such a magnitude and nature as those proposed in the scheme for the drainage of London; therefore, I fear the plan of removing the sewage by one or two main drains of some miles in length, will prove unsatisfactory. And supposing we allow that a channel of so many feet in width will be sufficiently large at the present time, it might not answer a hundred years hence; and where and at what period are we to stop or divide the flow of sewage, and construct an additional drain to convey it to the river or sea, and also make every provision for heavy rain falls?

At Watford they are unable to cope with a heavy fall of rain. When such takes place, I was informed, they shut off the flow of water to the tanks (after about the first half-hour), and suffer it to be discharged into an open ditch, which conveys this overflow to the neighbouring river. This may be also a source of annoyance to the locality, and unquestionably a covered drain should be substituted for the open ditch. No reasonable number of tanks or reservoirs would contain the water flowing through the sewers when heavy rains occur; and if such were possible, the liquid would be of little or no value for agricultural purposes.

When the population of London is increasing so rapidly, and food is required, is it not most unwise to throw into the river that which tends to promote the growth of all vegetables? We might, with equal reason,

cast into the Thames the waggon-loads of manure we daily observe leaving the City for the market gardens.

The sewage of Watford falls by its own gravity into reservoirs, and is then pumped up by steam power, and cast over fields of Italian rye grass, which consequently is cut six or seven times a-year; indeed there appears scarcely a limit to its growth, provided there is warm weather after the application of the sewage.

I submit we should hesitate no longer, but apply our energies not to seek a method of casting the sewage into the sea, but of utilising it: and if the drainage of the metropolis is so complicated and difficult a problem to solve, as to stagger the most clever minds amongst us, why not make an experiment in one district, with the view of using the sewage on the land.

Would it not be possible to drain a district into covered reservoirs, built near to or where a communication could be made with an existing line of railway; the sewage could then be drawn off, or made to flow from the reservoirs (not pumped) into closed railway trucks. Several of these might be filled at the same time; and these trucks could be brought from the reservoirs up an incline to the level of the railway by steam power, and then conveyed any distance into the country.

The system of precipitating the solid parts of the sewage is not recommended, for the manufacture of solid manure occupies too much time, and the expense of so doing, together with the nuisance it might create in the neighbourhood, renders such a process out of the question, at least as applicable to London. It is also asserted by some parties that much of the valuable fertilising properties of the sewage would be left behind in the water, which would be cast away, and so be lost by the agriculturist. Again, it must be recollected that the farmer does not require manure in a dry state, and although receiving the sewage, as here proposed, just as it issues from the drains (without being strained through a grating) involves greater expense in carriage, yet we save the cost of reducing the sewage to a dry state. And above and beyond all considerations, the system I suggest is the quickest way of getting rid of such an unpleasant article.

The closed trucks to hold the sewage should be filled without exposing the sewage to the air, and when filled, the trucks could be conveyed by railway, *by night*, and left at the various stations for, or at, the farms requiring the sewage. There would be no difficulty in having a short single line diverging from the main line* on a raised stage of timber, so that the trucks could be emptied without delay (by valves opening in the bottom of the truck) into the middle of a heap of earth prepared for the reception of the sewage, which would filtrate through or be absorbed by it, and form a rich compost; and this could without difficulty be carted to any part of the farm; or the trucks could discharge their contents into tanks formed immediately under the railway stage, so that the farmer could irrigate his fields, or make use of the sewage in any other way he considered best.

This arrangement for discharging the trucks whilst standing on the railroad, *above the depot*, is similar to the plan adopted for unloading coal at many stations.

It will be observed that, adopting the system I have sketched out, there is no necessity for pumping the sewage either into or out of the reservoirs or the trucks, and a large item of expense is thus avoided.

Now, as respects a heavy fall of rain:—First, it could be arranged that all the surface water from rain should be conveyed direct to the river;—this is objectionable, as the sewers may require flushing; but still, after a certain time the current of water from this source could be made to deviate from the reservoirs and flow into the river;—it cannot be supposed that by the adoption of any scheme for the drainage of London, *the Thames will be relieved from every impurity*. Secondly, if the depth of the reservoirs and other circumstances are such as to

render it necessary for flushing, that the rain water must flow the whole course of the sewers down to the reservoirs, then a system of pumping could be adopted to raise *this water only*, and discharge it into the river,—the engine required to draw up the loaded trucks could be employed in *occasional pumping*. It is submitted that after a certain interval for flushing the sewers, the rain water should always be run into the Thames, and probably in most cases the existing sewers would answer this purpose.

It appears, from the return of the Registrar-General, that 22 inches of rain have fallen during the past twelve months, viz., from November, 1856, to October, 1857, inclusive; and that this amount fell on 130 days only, out of which 12.33 inches fell on 20 days, and the remainder 9.67 inches fell on 110 days,—viz., 52 days from 0.01 to 0.05—21 days from 0.06 to 0.10—19 days from 0.11 to 0.15—10 days from 0.16 to 0.20—and 8 days from 0.21 to 0.25 of an inch; furthermore, that the average fall on these 110 days was 0.09 of an inch.*

Now to apply these results to the subject we have in hand, supposing that rain-water does not materially increase the flow of sewage, excepting when the fall exceeds the tenth of an inch, then we find that in 57 days ($19 + 10 + 8 + 20 = 57$) we may be compelled to allow a discharge of rain-water into the river Thames for a few hours each day.

I may be allowed to add that a locality between Kensington and Hammersmith, near the West London Railway, appears well calculated for the experiment I have suggested; and it is probable the chief work to be done in the way of sewerage would be the formation of intercepting sewers eastward to Kensington, Brompton, Knightsbridge, and Pimlico, and westward to Fulham, Hammersmith, &c. In the construction of these sewers, measures could be adopted, by means of sluices, to shut off the rain fall at any time, and cause it to flow into the Thames by its old course.

In conclusion, I have only to repeat, that open or closed main drains for the discharge of the sewage into the river as proposed in the scheme for the drainage of London, should not be adopted; and, further, that manure of every kind is too valuable an article to be wasted, therefore, every endeavour should be made to embody a plan for utilising the sewage; no insurmountable difficulty exists that I am aware of, why an experiment should not be made in one district; and when making this proposition, I am not insisting on the sale of sewage as a remunerative speculation,—but we all agree it must be removed, and if it is valuable on the land, and we can dispose of it at any price, it must be far better than casting it into the Thames a few miles below London-bridge; after all the labour and very great outlay, we shall in that case only remove the nuisance *a degree further from London*, and assuredly shall injure the atmosphere of another locality.

I believe it will be found that the application of the plan I have proposed would be met by the construction of nine sewage works,—six situated to the north of the river Thames, and three to the south of it.

It may be urged, that the removal of sewage in closed trucks by railway would be perfectly impossible, and I admit that the work to be done is indeed immense, but I believe, not impossible if London were divided into districts, and the rain fall allowed to run into the

* On referring to the same returns, I find that on only three days in the year 1855 rain fell 1.00 inch, viz., 14th July 1.42, 26th July, 1.15, and 20th October, 1.06 inches. In 1856, only one day the rain fall amounted to 1.00 inch, that is on the 26th June; we see from this, that it was a most extraordinary fall of rain for Greenwich to amount to 2.57 inches; nevertheless, such a fall of rain may occur again, and every allowance should be made for double this fall if we entertain the idea of pumping up the sewage to a higher level, as two days of a fall of rain may follow the one after the other.

* This could not be attempted in a cutting.

[illegible]

It has been through the high proportion of the very hardy, which have since this was originally initiated with an increased income of Fellows, new count down earnestly invites the contributing in the United Kingdom of the cost of fellowship, and very department. The pub-

He has already expressed its approval of these measures by adding no fewer than 197 to the number of Fellows since the 23rd September, 1856, in addition to which a sum of considerably more than £3,000 has been recently subscribed by Fellows and their friends for the purpose of enabling the Society to enter upon a new course of undiminished vigour. The long existence of the Society has rendered this the more desirable because there is now a serious diminution in the number of its supporters, owing to deaths alone; it appearing that it has thus lost as many as 322 in 10 years. The circular is accompanied by a detailed description of the plans of the Society for the ensuing season. It is stated that the country is responding to this appeal with great spirit.

SOUTH KENSINGTON MUSEUM.

During the week ending 28th November, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,125; on Monday and Tuesday (free evenings), 4,364. On the three students' days (admission to the public 6d.), 316. One students' evening, Wednesday, 129. Total, 6,934.

Home Correspondence.

MAGNESIAN AND OTHER SALTS.

SIR,—Referring to the conversation which I had with you, on the subject of the six salts, which are resultants of my patent processes, (sealed 14 January last) to promote the sanitary and agricultural improvements therein specified, I now beg leave to hand you herewith specimens of these crystals, and to add a short explanation of their nature and uses, which you kindly offered to lay upon the Society's table at its first meeting, along with these crystals.

It would have been more satisfactory to me to have read a paper before the Society, and to have answered any questions which the scientific and medical members of the Society might have put. But this cannot be accomplished at present.

The first series of crystals laid on the table is a double salt.

1. Phosphate of ammonia and magnesia, well adapted for scrofulous diseases and softness of the bones.

2. The second specimen of beautiful crystals, is also a double salt. A sulphate of magnesia and ammonia.

3. The third series of crystals is a double chlorate of magnesia and ammonia.

4. The fourth specimen of very minute crystals is rather a precipitate, and is a triple salt not hitherto used for health or husbandry, nor produced by art for these objects until now. It is sparingly evolved by nature in urinary and other secretions, and is composed of equal parts of phosphate of magnesia and phosphate of ammonia, both well suited, when thus combined, to restore strength to bones and tissues, and to afford phosphoric acid and ammonia to crops, in a far more economical and durable manner than can result from the too soluble superphosphate of lime, or the sulphate of ammonia now used, which, in wet soils, are carried off by floods. Three tons of rain water dissolve one ton of either mature in the single state, as now applied to crops.

These double salts, however, are ten times less soluble, and, of course, ten times more permanent.

This triple phosphate is still more durable in lands than even the double phosphates; it is slowly dissolved by common salt or other nitrates, and gradually gives out its nourishing elements as wanted by the plants. It is the white sand of Dr. Woollaston.

The fifth salt is a double one, namely, phosphate of soda and magnesia.

The sixth double salt is the phosphate of potassa and ammonia.

I now come to submit a brief account of the principle agents and *modus operandi* for generating the gases and their effects as motive powers, and as generators of the salts before you.

The compression of liquids by a gas pushing them up by the tension of a new atmosphere, self-injected, and driving up water to any useful elevation without steam-engines, pistons, or friction, may seem a costly operation. But the value of supplying good water to towns and rich liquid manures to farms—of generating these crystals containing all great manuring elements—of impregnating drainage with carbonic acid, and of supplying a force to scatter it over soils,—all these advantages more than repay the first cost of the raw materials used, and sometimes leave new resulting products free of expense.

The materials affording this self-acting propulsion are plentiful and cheap. When mixed in sewage they abate offensive smells and obnoxious miasms, and displace or dilute infectious airs in crowded localities.

Carbonic acid gas is here liberated from dolomite, either by mineral acids or by calcination in retorts with other carbonates. The gas is carried along with vapour, superimposing such a tense elastic pressure on water as to force up many hundred tons of sewage per day, with grit or silt, which do not pass through valves or locks by pumping. One square yard of dolomite or marble yields 16,000 cubic feet of fixed air, which, at the moment of its expulsion from red hot retorts, expands and displaces above 36,000 cubic feet of water, equal to about 1,000 tons of drainage.

One ton of dry bones liberates 300 cubic feet of fixed air which is now lost by super-phosphate makers, but by my patent manipulations, it is driven into the farmers' tanks to force up its contents imbued with fixed air, which is the natural food of plants. Another result from bones was hitherto lost, namely, the ammonia; but by my plan, ammoniates and phosphates are produced sufficient to unite with the excess of bicarbonate of magnesia, which arrests them all, and converts them into these double and triple salts, which are thus saved by this agent from melting away into subsoils and rivers.

An elastic compression results also from the evolution at their nascent temperature of ammonia, hydrochloric and sulphurous acid gases; separately generated and self-injected, they produce with animal drainage or exuviae the four salts presented to the Society.

As the sources of carbonic acid are boundless, so also are its agricultural benefits. It dissolves bones and limestone in soils, arrests and fixes ammonia, melts magnesian limestone, and forms the bicarbonate of that earth in a fluid state which I first produced and applied efficiently as a medicinal preparation in 1808.

Bicarbonate of magnesia in excess is now acknowledged to be the best deodoriser of bad breath and offensive emanations.

Sulphurous acid gas is another agent in our works, and a powerful disinfecting one. It was so used against pestilence in the Grecian camps at Troy, where Homer relates that they diffused this gas by burning sulphur in iron pans. It is now cheaply made by burning pyrites.

Hydro-chloric acid gas is also a disinfectant. It is produced from pyrites with common salt. The soda cake left in the retorts pays first cost, and is a salt valuable for soils.

Ammonia can be abundantly obtained from gas works, or by calcining coal dust and animal exuviae, thus affording a light elastic gas, which, like the others, if driven over liquids at the temperature of its evolution from the retorts, propels such liquids to any required place or service.

I am, &c.,

JAMES MURRAY.

Journal of the Society of Arts.

FRIDAY, DECEMBER 11, 1857.

EXAMINATIONS.

The following circular has been issued to the Institutions in Union with the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, London, W.C., December 4, 1857.

Sir,—With reference to the Circular Letter of the 25th ult., and to the Programme of Examinations for 1858, which accompanied it, I am instructed to direct your attention to the *Journal* of this day, the 4th of Dec., which will be found to contain a full report of the proceedings of the Special General Meeting of the Society, held on the 1st inst.

You will see that the Bye-laws, passed in February last, the operation of which the Council had suspended, on the ground of their illegality, were revoked as illegal, and that the new Bye-laws which the Council proposed, to enable them to reconstitute a Board of Examiners, in conformity to the Charter, were unanimously adopted; and the following resolution was passed by a very large majority:—

"That this meeting, while it recognises the value of Oral Examinations, continues to have entire confidence in the Council of the Society, and entrusts to it the working out of the question of Examinations among the Institutions in Union."

For the reasons briefly stated in the Address of the Chairman of the Council which was delivered at the opening of the present Session, and appeared in the *Journal* of Nov. 20, the Council are convinced that it is quite impossible for the Society of Arts to examine orally, on any fair and satisfactory system, all the Candidates that may be ultimately expected to be presented by the Institutes in union throughout England, Wales, Scotland, and Ireland, when the system of examination shall have become fully developed; but the principle of Oral Examination, in combination with Examination by papers, has always been appreciated by the Council as highly valuable in those cases where it is possible to guard against the capriciousness and risk of unfairness which are obviously inherent in the Oral system.

If the Candidates for examination were to be few, and capable of being brought to a single centre, the Council would certainly have them examined both orally and by papers; but in the case with which the Council have to deal the Candidates ought in a few years to be counted by thousands, and they cannot afford either the time or the money which would be required to convey them to, and to maintain them at, places of Examination distant from their own homes and from the scenes of their daily labour.

The object to be aimed at by the Council is, that, throughout the whole Union, wherever there is class-instruction, the students of the classes should have the advantage of Examination. The funds contributed by the Institutes in Union ought to be so expended by the Council of this Society as to afford to all parts of the Union, as far as possible, an equal amount of advantage. It must be borne in mind that the Union comprises Institutes ranging from St. Austell to Aberdeen, from Margate to Belfast, and from Limerick, through Wales, to Lowestoft.

The Council had no little difficulty last summer in obtaining the services of even four gentlemen who were able to go from London to Huddersfield as Examiners; no one has as yet attempted to show to the Council by what means it could obtain the services of an adequate number of the Members of the Society's Board of

Examiners simultaneously at the five places which were proposed: and the Council are quite satisfied that, even if five centres of Examination would meet the wants of the Union, which is obviously out of the question, it would be impossible for the Society of Arts to send simultaneously to those five centres the requisite number of Examiners adequately representing the authority of the Board and giving uniform judgments. It must also be remembered that the Oral Examination of such large numbers, simultaneously in many places, has not only never succeeded, but has never been even attempted; and that experience has abundantly proved that very large numbers can be well examined simultaneously at many places by written papers.

But there is still another difficulty—the difficulty of time—which involves also the difficulty of expense. A hasty Oral Examination is admitted to be the worst possible test; and every one can calculate for himself the length of time that would be consumed by the full and careful Oral Examination of the very large number of Candidates that ought ultimately to be expected if justice were done to all the Institutes in the United Kingdom.

These are only a few of the difficulties which make it impossible for the Society of Arts to extend the Examinations of its own Central Board otherwise than by papers. The Council, however, are of opinion that the previous examinations by the Local Boards may with advantage be conducted orally as well as in writing. Each Local Board, however, should determine this point for itself.

It has been alleged that men unable, or scarcely able, to write will have no chance of succeeding in an examination which is not oral. This is admitted; but it never could have been intended that the Society's Central Board of Examiners should examine persons who cannot write. The object of the central and final examinations is—not to provide for such exceptional cases, but—to promote the best possible education of the greatest possible number of persons connected with the Institutes in the Union. Writing is one of the first elements of education; and, as such, is properly to be tested by the previous examinations of the Local Boards. No Candidate who cannot fairly write ought to be presented to the Central Board.

It was stated, at the Special General Meeting, that, even in the great towns of Yorkshire, the Local Boards could not satisfactorily discharge the duties which the programme invites them to undertake, and that there would be suspicions of partiality, unless the local authorities were assisted by the presence of at least one member of the Society's Board of Examiners. The Council cannot entertain this idea. It is absolutely contradicted by the experience of Local Boards in Yorkshire, Lancashire, Cheshire, South Hants, Wiltshire, Devonshire, Berkshire, and London. The Council believe that there can be but few places where the formation of an efficient and impartial Local Board able to conduct a previous Examination would be really difficult. In all cases, however, where difficulties arise, the Council will do their best to assist in removing them, if invited by the local authorities to do so, by transmitting to any Institute an explanation in detail of what has been already done in forming Local Boards in various places; and, if necessary, concerting with the Institutes for sending an officer of the Society to assist them in organizing their plans.

By order of the Council,

P. LE NEVE FOSTER, *Secretary.*

FOURTH ORDINARY MEETING.

WEDNESDAY, DEC. 9, 1857.

The Fourth Ordinary Meeting of the One Hundred and Fourth Session, was held on

uesday, the 9th inst., James Caird, Esq., M.P., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Charles B. Clabon.
Joseph Farrar.

Eugene Rimmed.
John Edmund Willis.

Previously to the reading of the Paper, the Secretary called the attention of the meeting to some small working models, shown by Sir James Murray, illustrating the power to be obtained by gaseous pressure on the surface of liquids in closed vessels, with a view to its employment as a force for drainage purposes, whilst the salts in the sowage are utilized for agricultural purposes, as referred to in Sir James Murray's letter in last week's *Journal*, page 47. Some further explanatory observations on this head will be found at page 60 of the present number of the *Journal*.

The Paper read was:—

ON THE PROGRESS OF THE AGRICULTURAL IMPLEMENT TRADE DURING THE LAST TWENTY YEARS.

By S. SIMON.

The paper which I am about to read this evening, is an attempt to trace the progress of the agricultural implement trade between the years 1837 and 1857. I say I am about, because during the last twenty years the "progress" has been created and supported rather by a steady and increasing demand, which has led to important improvements in the details of the manufacture of agricultural implements, than by any extraordinary mechanical inventions, such as the Jacquard loom, the power loom, the reaping machine, which have, from time to time, and by revolutionized the cotton and silk trades.

I have selected, and shall endeavour to confine myself to the period that has elapsed since 1837, because, during that period four circumstances, viz., the importation of superphosphate of lime, the promulgation and adoption of portable machines, the promulgation and adoption of Mr. Joseph Parkes' system of deep drainage, and the extension of the railway system, have all combined to produce a revolution in the agricultural implement trade, which has led to the introduction of a number of new machines, some of which have been introduced into common use a number of years ago, and some of which have been introduced into common use a number of years ago, and some of which have been introduced into common use a number of years ago.

It is not my intention, that I am not about to read this evening, is an attempt to trace the progress of the agricultural implement trade between the years 1837 and 1857. I say I am about, because during the last twenty years the "progress" has been created and supported rather by a steady and increasing demand, which has led to important improvements in the details of the manufacture of agricultural implements, than by any extraordinary mechanical inventions, such as the Jacquard loom, the power loom, the reaping machine, which have, from time to time, and by revolutionized the cotton and silk trades.

within the period under notice, have been brought to bear upon the several operations of land drainage, the preparation of the soil for seed, the gathering of crops, and the preparation of crops for market, you will come to the conclusion that no standard manufacture has made more solid and rapid progress in England, within the last twenty years, than that of bread and meat.

I say England, because it is a curious fact that Scotland, which originated and adopted several cardinal improvements in agricultural implements fifty, and even a hundred years before England, is now, in agricultural implements, at least, twenty-five years behindhand.

Seven agriculturists make shift with barbarous implements, that have been discarded by all our best farmers; and where Scotch farmers use improved ploughs, drills, and sowing machines, they usually obtain them from English manufacturers.

With these preliminary observations, I will proceed to the subject of the evening, which I propose to treat, not chronologically, but, in the order in which the operations of modern agriculture are conducted.

Perhaps the greatest, certainly the most profitable, improvement of modern agriculture, is that obtained by deep drains, cut with tools and laid with porous earthenware pipes, which were practically unknown in 1837. In that year, at the exhibition of the Royal Agricultural Society, at Shrewsbury, a portable horizontal drain-laying machine, on a principle since become universal, was produced, which could make 20,000 pipe tiles in ten hours: two years previously, the first tiles exhibited had been made one at a time. In the following year, Mr. Parkes produced, at his Newcastle lecture on the principles of deep drainage, a set of the tools for cutting deep drains, which are still in use. The principles Mr. Parkes had been years considering, and maturing by experiment, but he rightly considered it useless to make them public until he could find a machine for manufacturing, with economy and rapidity, a suitable conduit pipe.

It is not necessary to enter here into the details of either the theory or the practice of thorough draining. It will be enough to state that with the help of tile drain machines and tools first made public in 1845-6, there have been, up to the present time, upwards of two millions of acres drained. By this process many hundred thousand acres of land previously in waste, or only fit, at best, for poor pasture, and many hundred thousand acres of retentive clays which could only bear corn in favourable dry seasons, have been brought into a regular rotation of arable cultivation, in which roots, the foundation of first class farming, take their place, and are even fed off by sheep.

Perhaps this is one of the most striking instances of great agricultural results from very simple mechanical assistance,—a clay pipe made by a machine that any labourer can work.

We will, then, suppose our soil rendered dry, porous and warm, better able to receive and absorb the fertilizing rain and atmosphere by a network of drains. The next work is to turn up the soil; to bury weeds deep enough to cause them to decay, so as to add to instead of exhausting the fertility of the soil; and to expose retentive soils to the mellowing influence of the winter's frost.

For this purpose we resort to the plough and the cultivator; spade digging is usually too slow, for even the horse plough is not fast enough to overtake the work that ought to be done before winter's rains and snow stop all autumn work.

It is not my intention to devote any considerable part of this paper to a consideration of the ancient history or modern curiosities of the plough—the most ancient and most universally useful of agricultural implements.

In the south of Europe ploughs are in use, even more primitive in construction than those employed by our Saxon and Norman ancestors, constructed either wholly of wood, or with the share armed with a thin point of wrought iron. And it must be admitted that, in a

warm dry climate, on the light soil which alone is devoted to corn-growing, in thinly-peopled, semi-barbarous countries (barbarous, speaking agriculturally,) a very rude implement, of no great strength, is sufficient to effect the slight stirring of the soil required before the seed is carelessly broad-casted. Nature does the rest, and on such a soil a genial sun often produces crops exceeding in quantity and quality the best returns of the best cultivated fields in our humid and more rigorous climate.

In England, the plough is not only required to bury the weeds and stubble, but to cut, move, and turn over a damp tenacious clay soil, often covered with a thick tough skin, the result of a crop of artificial grasses trampled and eaten closely down by sheep.

Twenty years ago, when the Royal Agricultural Society of England commenced the annual exhibitions which form the more prominent, and, certainly the most useful part of their operations, there were two or three ploughs constructed on very good principles in use in two or three English counties, but it is a curious fact that even the plough makers had but loose, vague opinions on the comparative merits of the forms of the ploughs they manufactured. At that period, the Ransomes, of Ipswich, had been manufacturers of ploughs for nearly a century; they had introduced, at the beginning of this century, several substantial improvements, for instance, cast-iron shares, case hardened on the sole, which were not only much cheaper than wrought-iron shares, but had the essential advantage of sharpening themselves when at work, because cast-iron sides wore away more rapidly than the case-hardened sole. But in the then state of agricultural intelligence and opinion, the Messrs. Ransomes made as many as eighty different kinds of ploughshares, of which some were good and some were bad, in order to accommodate the local prejudices of every county into which they sent travellers. At present, in common with all first class ploughmakers, they decline to make an ill-shaped plough to please any county or customer.

It would be impossible, within the limits of this paper, to describe the various kinds of ploughs that were in use, even amongst first-class farmers, in 1837. It will be sufficient, for the purpose of illustration, to mention that in a series of experiments instituted in 1839, by the late Henry Handley and the late Philip Pusey, two of the most intelligent founders of the Royal Agricultural Society, and in trials for prizes made at the meetings of the Society at Liverpool and Cambridge, in 1841 and 1842, the greater number of ploughs tried were of wood, with the exception of the share and the coulter. In several the mould board was also of wood. The greater number were swing ploughs, in which, being without wheels, the depth is regulated by the line of draught and the skill of the ploughman; some of them had one wheel, others had two high wheels, of equal size, and a cumbrous arrangement like the old wheeled ploughs of our Saxon ancestors, called "A gallows;" while two counties only, Bedford and Rutland, made use of ploughs with the two wheels of unequal size, of a model from which all the best ploughs in England at the present time have been constructed, and on which Messrs. Howard, of Bedford, have established their world-wide reputation.

On further examination of the details of the construction of the best ploughs produced in 1837, it will be found that the coulter, the wheels, and the other parts requiring occasional adjustment by the ploughman, were made fast by the clumsy expedient of wooden wedges. The well-shaped iron Scotch swing plough, and the well planned Beds and Rutland modern wheeled ploughs, were the exceptions twenty years ago. In almost every county there were to be found barbarous ploughs, of home construction, with wooden beam, wooden breast, wrought-iron share, and on the swing principle, with one fixed stilt and one loose stilt. Generally a hedgestake

a handle for the ploughman and a spud with which at frequent pauses he cleared the share of adhesive clay, or poked down the furrow, which "would insist on rising" behind the breast of his plough.

In 1837, and, indeed, up to 1842, the principal English agricultural writers wrote and argued that the swing plough worked with less labour for the horses, that is, less friction, than the wheel plough.

At the present day, in all the best cultivated districts of England, the ploughs in common use are almost all constructed on the principles of the one exhibited on the floor, one of Howard's P.P. ploughs, with more or less excellence of detail, according to the skill of the manufacturer. For many years past, no other form has had the slightest chance of winning a prize at the trials of the Royal Agricultural Society, and I am not aware of any instance in which it has not been successful at local ploughing matches. In the last trial at the Royal Agricultural Society's show, at Carlisle, in 1855, the swing ploughs, which local prejudice still retains in use there, as it does in Scotland, were signally defeated.

In Paris, at two exhibitions, the English form of plough was found as superior in mechanical arrangement as in materials.

It does not fall within the plan of this rapid sketch of the history of agricultural implements, to describe every variety of the half-dozen ploughs, for different soils and purposes, which every first-rate farmer has in use. These may best be studied in the illustrated catalogues issued by each maker, or, better still, in the department devoted to agricultural implements at the Crystal Palace.

Within twenty years, the *subsoil plough* brought into notice by Smith, of Deanston, for stirring and sometimes bringing up the soil, between the surface and drains, has been established as a standard implement, and is manufactured by all our established plough-makers.*

Mr. Bentall has attained a high reputation for the broad-share plough which bears his name, which can be used either for paring away a stem of stubble and weeds immediately after harvest, or, with an alteration of its parts, as a subsoil, "Bentall's broad-share" being one of the few absolutely new implements produced since 1837.

The harrow is as old, if not an older implement than the plough. In Australia, after rudely ploughing the dry soil, the settlers sow their seed broadcast, and cover it with a harrow of bushes, made as much as possible after the directions of Gervase Markham, two hundred years ago, who tells his readers to "get a pretty big white thorn tree, which we call hawthorn, and make sure that it be wonderful thick, bushy, and rough grown," &c.

But a modern harrow is required for covering seed, for breaking the surface clods of rough ploughed land, for loosening the surface of the soil, and thus allowing the air access to the roots of the plants growing on it, and for gathering weeds to the surface.

On the Continent, where iron is made costly for the benefit of ironmasters, the harrows are entirely of wood. In the oldest English agricultural works in which harrows are delineated, we find the teeth of iron, and the frame work only of wood, and that was the construction almost universal before the exhibitions of the Royal Agricultural Society commenced, and for some years afterwards. At present harrows entirely of iron are extensively used, and are daily gaining ground in agricultural favour, not

* In the *Museum Rusticum*, 1766, a Mr. Randall, of York, advertises a set of subsoil ploughs, viz., "A loosening plough, that goes one foot deep without either mould or coulter, so as to cut the ground 18 inches wide, leaving the soil in its place.—A lifting plough, to gather the soil so loosened, and make a clear trench 18 inches wide, and one foot deep.—Another lifting plough, with a broad wheel under the plough, throws it upon what the soil had raised up before."—Communicated by R. W. Blencowe, Esq., of Leves, to the Editor of the Bath and West of England Journal.

only in England, where they are, looking at their efficiency and durability, more economical than wooden frames, but even in France, in spite of the heavy protective duties on iron.

The form of iron harrow most esteemed is that first introduced by Messrs. Howard within the last twenty years, the form being zig-zag, with the teeth so arranged that each cuts a separate track at equal distances, and furnished with joints in the centre, which allow the frames to adapt themselves to the form of the ridges.

There is a century of agricultural progress between the old-fashioned wooden harrow and the simple, effective, durable iron zig-zag.

In addition to harrows, there are a number of powerful implements, under the names of scarifiers and cultivators, with curved tines of iron or steel fixed into a frame of wood or iron, which were known certainly twenty years ago, but which only became standard implements within the last period that has enabled farmers of every county to exchange their respective opinions and experience. Among these Black's scarifier and Coleman's cultivator generally hold a high place. I mention them particularly, because, although the idea of such implements may be traced back nearly fifty years, their present form and materials, cast-iron frames, with wrought iron and steel teeth, are the result of mechanical facilities which have only been created within the period of progress mentioned in this paper.

The soil having been ploughed and harrowed, and, if needed, scarified, or dragged, rollers come into use, either before or after the crop is sown, and here we again meet with striking instances of the advantages we enjoy from cheap iron and cheap conveyance.

To crush down the clods—"horses' heads" they are called by country folks—which will defy the efforts of harrows and harrows, our fathers used rollers of wood and stone, and sledges heavily loaded, as the French and German farmers do still, and often employed labourers armed with heavy hoes, called in those times by the then familiar now forgotten name of clodders. Our rollers are now almost invariably made of cast-iron. A dozen in a line were exhibited by as many manufacturers at the last year's show in July last. The first invented, and the most successful and most universally effective is the "patent" roller, which consists of "a number of cast-iron cylinders of different sizes, placed side by side in a frame, and from five to six feet in length, so as to form a continuous series of each other. The outer surface of each cylinder being serrated with a series of sharp, pointed teeth, which cut perpendicularly in

the soil, and are used for crushing clods on heavy crops, and for rolling corn as soon as sown on a level, or for rolling wheat after frosts and winds have

left the plants bare. 4th. For stopping the ravages of the wire-worm and grub. 5th. For rolling turnips in the rough leaf before hoeing, when the plants are attacked by the wire-worm or grub, and for many other purposes in this country and on the continent. Crosskill's clod-crusher was invented in 1830, ten years before railways created agricultural travellers. It was by the mere accident that this valuable implement was not broken up for old iron, after being three times exhibited without obtaining any notice or honorary reward. But it was at length purchased, and tried by some score of enterprising agriculturists, the first being a clergyman, a cousin of the late Sir Robert Peel. Mr. Pusey published a chapter of testimonials to the value of the clod-crusher, and in the same year, when it was in full operation in many counties, the Society presented the inventor with its gold medal. Having with the modern ploughs, harrows, scarifiers and rollers, reduced the soil, whether strong clay, rich loam, or light sand, to a condition fit to receive the seed, sowing is the next operation. Twenty years ago the roots, in all but two or three of the more advanced counties, and nearly all the corn crops of England, were sown by hand, broadcast. The sower went forth to sow with a sheet, knotted into a bag, before him, and with an even swing distributed the seed over the land, where the regular furrows made by the plough were a great assistance in securing an even distribution of the crop. In those days, sowing was an act which was carried to extraordinary perfection; a clever broadcaster would broadcast fifty acres without making the difference of half-a-peck an acre. More than a hundred years have elapsed since the ingenious and unfortunate Jethro Tull invented a machine for sowing corn in regular rows, for the purpose of admitting the use of his horse-hoe. Tull's system of cultivating by stirring the soil without manure, being only half a truth, failed, and his plans of mechanical cultivation fell into undeserved neglect. Between 1782 and 1800 several drills were invented, the best, according to Mr. Allan Ransome (in his "Implement of Agriculture"), being by the Rev. James Cook, of Heaton Norris, Lancashire, which is delineated and described in the 5th volume of the *Letters and Papers of the Bath and West of England Society*, and bears a strong resemblance in outline to the modern drill. But drills made no progress in public favour until turnip culture, with purchased portable manures, was introduced into Norfolk, in order to economise rape cake, the only artificial manure. One of the first used in Norfolk was invented by a blacksmith, for the father of Mr. Hudson, of Castle Acre, fifty years ago. Five and twenty years ago, the drill, manufactured then as now, by the since widely-known names of Garrett, of Leiston, Smyth, of Peasenhall, and Hornsby of Grant-ham, was scarcely to be found beyond Norfolk, Suffolk, and Beds, in a few counties where the Norfolk rotation had extended. The use of the drill spread in proportion as the use of artificial manures spread. Since 1837 an enormous trade and manufacture of portable manures, applicable to both root and corn crops, has been established, and the trade in drills has followed step by step the trade in guano, nitrate of soda, and superphosphate. At the late Exhibition of the Royal Agricultural Society at Salisbury, twenty-three exhibitors, from almost every agricultural district of England, appeared on the ground with drills adapted for every purpose and every kind of land, with from three rows to fifteen rows, able to deposit manure on one side or under the seed; to sow corn, turnips, mangold wurzel, clover, and small seeds; to broadcast artificial manures over growing crops; to wash in manures with water; to sow on hill sides; in fact, to meet every requirement of the farmer—the universal use of purchased manures having compelled the equally universal use of the economising action of the drill. Yet, in 1837, the drill was scarcely used out of Norfolk, Suffolk,

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and Bedfordshire. In 1861, it was difficult to find a man able to sow broadcast, and a Norfolk farmer has been obliged to invent a broadcasting machine for top-dressing corn with artificial manures.

The horse hoe, to cut up weeds and stir the soil between roots or beans, follows the seed drill, as a matter of course, along the perfectly straight lines of vegetation produced by the machine sowing. The earliest horse hoe was Jethro Tull's, but that was a sort of plough, not the least like the invaluable implement which is identified with the name of Garrett, the "Inverted Horse Hoe," or the other horse hoes now in use.

The original of this implement is to be found in an inverted horse hoe, invented by the late Francis Blaikie, nearly fifty years ago, when agricultural agent of the late Earl of Leicester, to follow the rude drill already mentioned. This was one of the very many valuable contributions to agricultural progress made by Mr. Blaikie, while in the service of a landlord whose extraordinary exertions and extraordinary success in establishing a new system of cultivation, and in turning a waste of sheep walks and rabbit warrens into the best corn land of England, is familiar to every student of the agricultural history of England. The horse hoe does in time what no possible number of hand hoes could do at all.

The old form of plough horse hoes buried the plants; the modern horse hoes, whether inverted or of triangular shape, travel close between the rows, cutting up weeds and stirring the earth without doing the slightest damage, even when the rows are very near each other. One man and a boy, with this implement, can hoe from 10 to 15 acres a day, at a cost of about 6d. an acre. It was as little known as the drill, out of Suffolk and Norfolk, in 1841, when it was exhibited and rewarded at the Royal Agricultural Society's show at Liverpool. But, like the drill, the use of the horse hoe has received a much more powerful stimulus from the invention of portable root manures, and specially from Liebig's superphosphate of lime, in 1844-5, than from any number of exhibitions or prizes. It is not enough that an agricultural implement is ingenious; it must be profitable in time or money saved, if it is to be the subject of a great standard trade.

In the drill and the horse hoe, which have made such rapid conquests over agricultural manual-labour prejudices, since the age of railroads began, we find not only a saving of hand-labour that can be otherwise more usefully employed; not only a saving of time, so invaluable in our weeping uncertain climate; not only a saving of manure too costly to be wastefully distributed, but a combined mechanical war upon weeds, which under the system of broadcasting, were often sown with the seed, and thus filled the place and exhausted the fertility due to food-producing plants.

As to the progress in the manufacture and sale of these twin implements of high-farming, I may venture to assert that there is not a respectable ironmonger in a country town in England, who has not drills and horse hoes on sale alongside of the ploughs and ploughshares, and harrows of the best model, if not the best manufacture.

Having thus far rapidly sketched the economy of time, labour, seed, and manure, which mechanical science and skill have brought to bear on draining, ploughing, harrowing, dragging, rolling, drilling, and horse hoeing, I will make a leap over the minor intermediate processes, and proceed to consider the present condition of the implements for gathering crops.

Here the improvement within twenty years is very striking and very rapid. Necessity, in this part of agriculture, left our farmers little choice. A frightful national calamity, in one year, swept away hundreds of thousands of haymakers and reapers, the pith and marrow of the itinerant bands of Celts who yearly crossed the Irish Channel to gather Saxon crops.

Farmers were slowly converted to the use of the best forms of iron wheeled ploughs, iron harrows, cultivators, scarifiers, drills, and horse hoes, by example, by speeches, and by reports, but it was the dearth of labour suddenly created, and unexpectedly maintained by famine, an enormous emigration, and war,—which forced the way for the progress of the haymaker, the horse rake, and reaping machines.

I shall not attempt to describe the several haymakers, all on the rotary principle, each of which, with the aid of the horse rake, does the work of forty men or women, making hay better and more quickly than the best disciplined hand-labour.

There are half-a-dozen makers, the names best known being those of Smith and Ashby, of Stamford, and Nicholson, who established a reputation at the Salisbury show this summer. All are founded on a plan patented by Robert Salmon, of Woburn, (an ingenious mechanic, patronized by Francis, the great agricultural Duke of Bedford,) in 1816. Salmon also invented the well-known excellent Bedford drill, and many other capital improvements in agricultural implements, but he was a quarter of a century before his time. There were too many paupers, too much surplus labour. Conveyance and coals were too dear in 1816. But his mechanical labours have since borne good fruit and done good service to the state; while more fortunate than many inventors, he was appreciated and rewarded during his lifetime by the nobleman who did for Beds what Thomas Coke, Earl of Leicester, did for Norfolk, and the first Lord Yarborough for the Wolds of Lincolnshire.

The first haymaker in the shows of the Royal Agricultural Society was exhibited at Liverpool, in 1841, by Wedlake, and rewarded with £3, but there was no great demand before 1860; since that date the demand has been, at every show, greater than the leading traders could easily execute.

Reaping Machines stand next in time and importance to the haymakers.

These, like so many other agricultural implements, were invented long before they were needed. The first working machine, like the drill, we owe to a clergyman, the Rev. Patrick Bell, who, for his amusement, invented the reaper now so well known as Crosskill's Bell. He made it, when a student, with his own hands, with the assistance of his brother and a country blacksmith, in 1828, and tried it for the first time in a shed, where he had planted stalks of corn, as children make gardens with cut flowers; then successfully in an open field; and, finally, for thirteen seasons, cut his father's crops.

But although Bell's reaper was rewarded by the Highland Agricultural Society, a quarter of a century ago, and worked on his father's and brother's farms for many years, it was not needed. Reapers and mowers were cheap, and clamorous for employment, so it lay forgotten in his brother's farm, until, at the Great Exhibition in 1851, an American, M'Cormick, exhibited a specimen of a reaper on a totally different plan to Bell's, which, under the strong pressure of necessity, had been invented, manufactured, and extensively sold in the thinly-peopled districts of the United States, for nearly twenty years. Another American quickly followed with the reaper, now so well known as Dray's, and, lastly, Bell's was exhumed from the obscurity of the Inchmichael Farm.

The American Reaping machine arrived at an epoch when the absence of the accustomed armies of itinerant Irish labour had not only raised the wages of hand-reapers and scythemen very considerably, but caused a delay of a very serious character in getting in ripe crops. Bell's machine was improved by borrowing one of the American knives, and other details. The American machines were altered and strengthened, in order to meet the requirements of the heavy English crops, and, after six years' experience, in Yorkshire, Lincolnshire, Norfolk, and Bedfordshire, during which the supply of itinerant labour has rather diminished than increased, it is safe to affirm the

home as much as he could conceal for the use of his family or his pig.

No matter how pressing the demand of the market, the farmer could only realise his corn crops when the slow irregular manual work had been dragged through in an uncertain number of days.

After the riots there was an attempt to conciliate the prejudices of the labourers by hand-driven machines, but these were as hard to work as the flail, and in some counties the farmers returned to horse machines at the request of the labourers themselves. For English use, the portable steam-driven threshing machine has been invented, and although not equal, either in economy or efficiency, to fixed barn machinery, it is an invaluable machine, because it enables one machine to do the work of many farms, and enables the farmer to save carting by working at the side of ricks built on distant fields, and in the course of a day to turn from seven to eight hundred bushels of wheat into the next thing to cash, if a railway station lies handy. Portable steam driven machines have enlarged the trade of those local mechanics who do good service by hiring out what many farmers are unable to sink capital by purchasing. Less than seven years have elapsed since, under the influence of railways and the great annual fairs of the Royal and other Agricultural Societies, steam-driven threshing machines and barn machinery have been brought to their present perfect and economical condition.

As for flail-threshers, the difficulty in the best cultivated counties is to find a man who will consent to take a flail in hand. You must seek these antiquated instruments of stupefaction, either in very remote rural districts or in the metropolitan counties, Surrey, Bucks, and Essex, where, curiously enough, specimens may be found of the worst system of cultivation and the most barbarous implements. Shallow bush-draining—roots broadcasted—wooden breasted, one-stilted, swing ploughs, and flail threshing.

Having brought the principal crop of the farm into a marketable state, fit to be sent by rail to the corn-factor, to be pitched at market in bulk, or carried in those little calico bags in which the true British farmer keeps his corn-samples and his money; having shown how, within twenty years, every operation has been rendered more perfect in execution, more economical in money payment, and in most instances much more rapid, I must not conclude this faint sketch without saying something about the most modern and most important mechanical aid to agricultural progress—the steam-engine. Steam-engines were practically unknown on the farms of England twenty years ago; in the counties where they were most needed, the coal and the means of transport from the manufactory were alike wanting.

A portable steam engine (on the disc principle, which totally failed), was exhibited at Liverpool in 1841. Yet, in 1843, the manufacture and letting on hire of travelling engines to drive threshing machines, was mentioned by Mr. Pusey, in the Royal Agricultural Society's report, as having become a regular business, although "the Fire Insurance Companies charged an extra one per cent. where they were used."

In 1846-7 the demand for portable steam engines and threshing machines was so well established and steady, that a large capital was invested in erecting a great factory in Lincoln, for the sole purpose of manufacturing agricultural steam engines and threshing machines.

This establishment has, up to the present time, turned out upwards of two thousand steam engines, lately at the rate of five hundred engines per annum, and this great trade has been done without trenching upon the business of the half-a-dozen manufacturers who preceded Messrs. Clayton and Shuttleworth in that particular branch of the agricultural implement trade. In the catalogue of the show at Salisbury in 1867, I find not less than twenty exhibitors of fixed and portable engines, including the names of Horneby, of Grantham, Clayton

and Shuttleworth, of Lincoln, Barrett and Exall, of Reading, Cambridge, of Bristol, and the Ransomes, of Ipswich, whose names are all identified with the more important features of the mechanical displays of the Royal Agricultural Society. The continuous supply is the best evidence of the continuous demand—a demand created and supported by easy and cheap conveyance of iron, coal, manufactured machinery, and agricultural crops, and by a labour market which has, for the last ten years, been drained by internal and external migration from the rural districts to manufacturing towns at home, and colonies beyond the sea.

The agricultural steam engine is the essential adjunct of every well cultivated farm within the influence of a railroad and telegraph station. Under the charge of an ordinary farm labourer, an engine of from five to eight horse-power drives the barn machinery, cuts chaff or roots, crushes oats, grinds corn, pulps mangold wurzel, splits beans, saws wood, pumps water, and lends its boiler for steaming potatoes or roots, while men and horses are more usefully employed in other regular work of the farm. "And what," some of my auditors may at this point feel inclined to exclaim, "about steam ploughing?" Why very little this evening.

This subject so zealously investigated at the present moment is too large to be treated in a paragraph, but I will venture to state that the farmers of England, in this year 1867, are ripe and ready to receive and support a steam cultivator, which will perform its work as efficiently, if not as economically, as the threshing machine and the drill; indeed, it is not a substitute for horse-power that is so much required as a machine which can be used at a time and under circumstances when no number of horses could do the work required.

The cost of ploughing and cultivating easily or naturally drained soils is so low (from seven to fourteen shillings per acre), and is performed so efficiently with modern implements and good horses, that I confess I do not see, even looming in the distant horizon, any steam arrangement which, on light-land farms, is likely "to seal the doom of the plough," to use a favourite phrase of Mr. Mechi's; and this opinion of mine is shared by the most advanced agriculturists and the most distinguished engineers.

But there are in this country vast tracts of retentive adhesive clays which, in the best seasons, require an enormous amount of horse-power to work, and in wet seasons cannot be touched at all. No team is strong enough to draw the plough; no horse's foot can touch such soil without permanent injury. If a machine can be contrived which can be set to work the moment the crop is off the ground—when horses and men are most busy,—a machine which can execute its ten acres in daylight—if it can work on by moon-light or lamp-light, so much the better—then thousands of acres of first-rate corn-land, such land as is to be found in the Wealds of Sussex and Kent, in Dorset and Oxfordshire, can be turned up and cleared of weeds before Christmas, thus exposed to the mellowing influences of winter frost and snow, sown early in spring for root crops, and brought into regular rotation, which now for want of horse-power, or in consequence of a wet season, can never be touched until spring, and then grow as many weeds as roots or corn. A machine that would do all this would earn £1 an acre from a clay-land farmer. Towards this desired end Messrs. Fowler and Ransome, and Mr. Smith, of Woolston, have been working in a manner which holds out good hopes of success, and if they do succeed—not in cultivating well—that they have done—but in cultivating economically, they will increase the value of the arable land of the country as much as it has been increased within the last ten years by the promulgation of the cardinal agricultural improvement of this century, "Parkes's system of thorough-deep drainage."

I have not left myself room to say much about the simple yet invaluable machines for preparing food for

Mr. Barrett has been in the
The Government of Mr. Barrett has
these recent improvements in drills, the
Thomas Chambers, of Norfolk, should be

associated with a machine for the distribution of liquid manure, and great improvements in that descriptions of implement were introduced by Mr. Chandler and Mr. Cooper. With regard to the horse-hoe, with which his name had been connected, he would state that the only merit to which he laid claim, was the application of a lever to the hoes, so that each hoe acted independently of the rest, and adapted itself to the irregularities of the soil. The implement referred to by the author of the paper as having been in use forty or fifty years ago, and having been invented by Mr. Blaikie, was similar to that now so generally in use, only not having the separate adjusting lever.

Dr. MATTHEW TRUMAN differed from the author of the paper as to the utility of giving rewards for inventions, though it might be difficult to trace the discovery of any great mechanical invention to the circumstance of a premium offered for that object, yet in the aggregate he regarded the giving of rewards for such purposes as of the greatest importance. It had struck him that one of the greatest defects of which they had to complain in the present day was the alleged impracticability of turning the sewage matters of large towns to profitable account for the purposes of agriculture. He believed that arose a great measure from the want of proper stimulus to the investigation of the subject, in the shape of a commensurate reward. It was all very well to say that the reward would naturally accrue to the person who made a successful discovery; but in the absence of such an incentive as the offer of an adequate prize would afford, the matter could only be undertaken by the formation of a company, and it was well-known that, generally speaking, scientific men were the worst commercial men in existence; and there was little inducement for them to devote their time and energies to make discoveries of that nature. Many cases, however, might be mentioned in which the most striking results had followed the offering of premiums for important discoveries. Dr. Truman proceeded to illustrate this remark by an allusion to the high premiums offered by the great Napoleon for the successful introduction of the manufacture of sugar and gunpowder in France, at a period when all the French ports were in a state of blockade.

Mr. ROBERT BAKER had attended for the purpose of listening to what had proved to be a very able paper on the subject of agriculture, but he confessed, as an Essex man, he had not expected to hear the attacks which had been directed against the farming in that county. Taking the statement of Mr. Sidney himself, that his own experience in agricultural matters did not extend beyond a period of ten years, it was fairly to be presumed that he had not had much opportunity of investigating, at least from personal acquaintance, the farming of the different counties of England, much less, probably, that of Essex, which was a metropolitan county, for here the adage would hold good that a man knew less of what was passing around him than of what occurred at a distance. For that reason, perhaps, the author of the paper had formed some erroneous opinions with regard to the agriculture of the county which he (Mr. Baker) represented. Although, perhaps, he could not claim for the Essex people the title of the best farmers in the kingdom, they could, at least, enter the lists with any other portion of the country in the manufacture of agricultural implements and machinery. There was present in the room a gentleman who, he ventured to assert, represented a firm who had done as much for agriculture, in the shape of invention and manufacture, as any in the kingdom,—he alluded to Mr. Bentall. Mr. Sidney had dated all the improvements in the plough from the year 1837. The Messrs. Bentall had invented a plough, nearly or quite equal to that which Mr. Sidney appeared to regard as the model implement, fully 20 years before that date, and it had been extensively used in Essex. The Messrs. Ransome followed in the same course, and produced excellent ploughs even at that time. The case-hard-

ing of one side of the share, gave the pre-eminence to the Essex plough. The old wooden plough had been gradually superseded by implements manufactured entirely of iron, but he was of opinion that in Essex there was as good ploughing forty years ago as at the present day. Although the implement was of a ruder character, yet it effected the object as well as the modern ploughs. Another very important point, was the comparative cost between threshing by hand and steam. He believed the farmers present would agree with him, when he asserted that the difference the author of the paper had asserted to exist between the two, was not borne out by practical experience. It had been stated, that wheat threshed by the flail, cost 4s. per quarter, whilst with the steam-threshing machine it was done for 2s. 6d. per quarter, and upon that basis, Mr. Sidney calculated a saving to the farmers of the country of a million and a-half of money. He (Mr. Baker) denied that statement *in toto*. There were persons in Essex who kept threshing machines to let on hire. One person had as many as six machines, in the neighbourhood in which he resided, and only last week an advertisement appeared, offering to thresh corn and perform the operations of dressing—all hands found—at 3s. 6d. per quarter—the farmer, he presumed, providing the coal for the engine—whilst it could be threshed by the flail and dressed for 2s. 6d. per quarter; and, therefore, flail threshing, though not so expeditious, was the cheaper of the two. He had not attended that evening with any intention or desire to disparage the use of these improved implements. He had always been an advocate for progress in agricultural machinery, and the first idea of the broad share plough was obtained from an implement which he (Mr. Baker) had brought out, the idea having been taken up and improved upon by Mr. Bentall. If, therefore, the farmers stimulated the manufacturers of machinery, he believed more would be achieved than had hitherto been done.

Mr. J. D. MARION, having returned from a visit to several agricultural shows in Ireland, and the recent exhibition in Waterford, could state that there had been extensive displays of implements and machinery from all parts of England, and some from abroad. He thought the premiums offered at their shows had a beneficial influence. Ireland, not being a manufacturing country, had all these scientific improvements brought to her doors, and the Irish farmers were enabled to avail themselves of machinery brought from great distances, which, he was happy to say, they were now extensively using.

Mr. J. J. MECCHI thought it very important that no misapprehension should exist with regard to the comparative expense of hand and steam threshing. He had used a fixed steam engine on his own farm for ten years, and, practically, he found that he could thresh his long-strawed mown wheat at 1s. 6d. per quarter, including every cost. In that respect there was a great discrepancy between the statement of his friend Mr. Baker and his (Mr. Mecchi's) practical experience. Working with his machine, he could thresh 30 quarters per day, in which 16 men, women and boys were engaged, whose wages could be easily calculated, taking those of the men at 11s. per week, and the women and boys in proportion. The coals were at the rate of 1s. per cwt., about 10 cwt. per day being consumed; and, allowing the ordinary charges for the use of the machine, he could not put the expense at more than 1s. 6d. per quarter, making a difference of more than one-half between the calculations of Mr. Baker and the results of his own practice. He had even been given to understand that Mr. Hudson, of Castleacre, threshed his corn at an average of 1s. per quarter. Under these circumstances, he thought it ought not to go forth that hand threshing was cheaper than machine threshing. Mr. Mecchi alluded to the great advantages which he expected to result from Halkett's guideway steam cultivator, upon a system of rails 1s'

down on the farms, an important element of what was the facility with which the labour was conveyed from off the land. He did not doubt that Essex was at all a badly-farmed county. His view of it from what he had seen, was that it ranked among the best-farmed counties of England, although some of the Essex people were surprised in some parts of Yorkshire and Lincolnshire in the quantity of what they produced.

Mr. WALFORD had noticed, with some surprise, the remark made in the paper that many important inventions and improvements in agriculture had emanated from clergymen, whilst the majority of such inventions had not been introduced by practical farmers. It was singular that the farmers themselves should have made comparatively so few improvements in the instruments which they employed; and, if clergymen had been instrumental in effecting these improvements, he apprehended they had done so by virtue of superior education. They must, therefore, look to the education of the farmers to make more rapid progress, and at a time when so much attention was paid to the education of the tenant farmers, they might hope that the progress in this direction during the next twenty years would be far greater than that which had taken place during the period embraced in the present paper.

Mr. THOMAS SCOTT said, the remarks of Mr. Baker suggested that it was necessary for gentlemen to rise up in defence of their respective localities. With respect to the north (from which the reaping and threshing machines had emanated) having been distanced by the south he did not think the meeting would agree with Mr. Sidney. With reference to the system of agriculture in Scotland, he would state that it was hardly possible to go upon the premises of an intelligent farmer there, without finding a melancholy pile of discarded implements patented in the south; and they had before them the fact that, at all events, the Scotch system of agriculture realised good rents to the landowners, profitable returns to the tenants, and far better wages to the labourers than was the case in the south. With regard to steam threshing, he was of opinion, with Mr. Mechi, that with a fixed engine it could be done at 1s. 6d. per quarter, and on this matter he spoke from the results of his experience over two thousand acres of wheat. He asked, in the house from Mr. Baker, whether in Essex they paid the labourers sufficient wages to enable them to keep up the physical condition necessary for the hand labour which such gentlemen appeared to advocate. He did not agree with Mr. Sidney, that the prizes of the day, as they were called, had done little to stimulate the progress of the agricultural trade. Mr. Scott commented that the success of Tuxford, who had twice received the British Agricultural Society's medal, had been mentioned in the paper, whilst the names of several eminent farmers had been mentioned. Although he was not at the time of saying that he regarded the subject as a technical department, yet, having seen its results, he had made it one of the most important departments ever made, and there was an improvement yet to be made, which he thought might well be substituted—the steel digging fork. During the last two years he had made experiments with it upon 200 acres of land, consuming not only the cost of ploughing, harrowing and sowing, but also the results of the two operations. The price paid for digging was at the time about 22 per acre. The land could be dug to a depth of 18 inches, and he found that it was much more productive in all crops—especially green crops—and made the ordinary method of tillage, even with a double-furrow, a waste.

Mr. WILKINSON, in reply, said, expressing the interest he had derived from the reading of the paper, thought that the author had endeavoured to prove too much. The use of the double-furrow had continued for the last 20 years. It had been a dish in vogue 40 years ago, and about the

same period this implement was in extensive use in Norfolk. Four out of five farmers in that county employed the double-furrow in the years 1819-20. He thought the saving in steam threshing had been put at too high a price, with which it was, doubtless, a great improvement, but which was not largely employed with advantage. Under ordinary circumstances he did not think the difference would be more than 6d. or 9d. per quarter. To farmers who were anxious to realise their crops speedily, the steam engine was unquestionably a great boon. He thought the remarks would not be regarded as in opposition to the use of steam in farming operations, but he thought Mr. Sidney had put the case too strongly. He had used the seven-breasted plough 45 years ago, and had then made a prize cup from the Bedfordshire Agricultural Society. With regard to the fork digging mentioned by Mr. Scott, he could only say he should be sorry to see it used at 22 per acre.

Mr. MECHAN said, with the steel fork a labourer would earn his wages at that rate of pay.

Mr. SCOTT added that some of his men earned twenty-four shillings per week by it.

Mr. WILLIAM DAY, as a consumer of bread and meat, and therefore interested in the price of those staple commodities, would be glad to hear from some of the practical gentlemen from the country how it was that, with all the late mechanical and scientific improvements in agriculture, the price of bread and meat had continued so high.

Mr. FURBAST COOPER said, he wished to state his experience as a joint proprietor in steam-threshing apparatus in what was considered at one time the worst part of Yorkshire. The steam-engine and threshing-machine had been employed there with the most satisfactory results. The wheat was threshed at a cost of from 1s. 6d. to 2s. per quarter. Moreover, wheat dressed by the steam-machine always bore the preference, amongst millers, to that threshed by hand labour. At the same time, those machines might not be attended with equal profit on small occupations, and on that point he did not go quite to the extent of Mr. Mechi's opinion.

Mr. MECHAN remarked that no farm of 300 acres ought to be without a steam-threshing machine.

Mr. G. H. RAMSAY thought that this subject, so ably treated in the paper, had been of great use to the agriculturists; and whether the improvements mentioned dated from 1836 or 1856, was, in his opinion, a matter of small importance. There had been, for some years past, a great and increasing demand for all kinds of agricultural produce; and he thought that Mr. Day was unreasonable in asking that meat should be sold at a less price than it would fetch in the market. If a population was doubled in the course of a century, notwithstanding a vast quantity of hitherto waste land was annually brought under cultivation, he could not understand how the increased demand was to be met. Upon the subject of steam-threshing, gentlemen from the same county did not agree to the saving effected, one placing the cost at 1s. 6d., and the other at 3s. 6d. per quarter. He could do his own threshing at 2s. per quarter, and he considered that an excellent price. There was an association in the north of England, by whom the work was done at 2s. per quarter, and a good dividend was paid upon the capital invested.

The CHAIRMAN, in closing the discussion, said he was sure they must all have been interested by the able manner in which Mr. Sidney had treated this subject, and by the manner in which it had been treated by those who had taken part in the discussion upon it. He thought they were open to a great deal of instruction from their grandfathers, and he felt indebted to Mr. Bennett for having shewn them that 40 or 50 years ago people did know something about the plough. No doubt the great improvements effected in the manufacture of that implement had cheapened the cost of production, and although they had passed through four prosperous years for agri-

culture, they would yet require all the economy that the intelligence of agricultural implement makers could bring to bear. Foreigners attended our agricultural exhibitions in large numbers, and were large purchasers. The machines were thus taken abroad to compete with the English farmer. They would, therefore, see the necessity of doing all in their power to improve their own productions. As to the charge brought against the agricultural community by Mr. Day, that the price of meat did not keep pace with the improvements in agriculture, he begged to say that it was not the fault of the farmer that meat was at its present price, but the fault of the consumers themselves, who had increased in a greater ratio. With regard to the criticisms in which Mr. Sidney had indulged, it was some consolation to him, to find that three of the most important machines—which had conferred such great benefits upon English agriculture—viz., the horse hoe, the reaping machine, and the threshing machine, were all the inventions of Scotchmen.

Colonel CHALLONER had great pleasure in proposing a vote of thanks to Mr. Sidney. Had time permitted, there were several points in the paper which he could wish to have touched upon. The great question of the present day in agricultural matters was the advantages of steam ploughing and steam threshing machines. It appeared to him that the great advantage of the application of steam power to matters of that kind, was where farming was carried on upon a very large scale, and where labour was deficient. He did not agree with Mr. Sidney in his disapproval of the plan of giving rewards for the invention of implements of real practical utility. The Royal Agricultural Society, after a great deal of consideration, thought so much of the necessity of endeavouring to apply steam to the cultivation of the soil, that they offered a premium of 500 guineas for an implement to turn over the soil, as nearly as possible, upon the same principle as was effected by the spade in hand-labour, and many such machines had been produced. The Society had been the originators of a vast deal of mechanical talent. They had shown the agricultural machinist the machine that was wanted, and he hoped the time was not far distant when this great agricultural desideratum would be realised.

The vote of thanks was then seconded by Sir JAMES ANDERSON, M.P., and carried unanimously.

Mr. SIDNEY, in reply, said, he had not attempted a history of invention, but a history of trade, which was the most certain evidence of agricultural progress. He had not intended to make an attack on Essex, but he stated an undeniable fact. Within a few weeks he had been hunting in Essex, and had there seen wooden swing ploughs, with a hedgestake spud stilt, turnips broadcast and drained with shallow open ditches, and farm buildings where the manure was put on a heap to drain into the ponds. He was not going to defend the steam threshing machine against the flail; that question had been decided by the farmers of England against Mr. Baker, for they had purchased thousands of machines, and were purchasing more every day. As to the Council of the Royal Agricultural Society, there could not be the slightest question that the great landlords, of which it was virtually composed, had rendered essential and invaluable services to agriculture by their great exhibitions, and the zeal for agricultural improvement which they had cultivated by precept and example, but an analysis which he had recently made of the prize-sheets of the Royal Agricultural Society for seventeen years, proved that, while a long series of useless toys had been rewarded, such valuable improvements as Bentall's broadshare, Coleman's cultivator, Crosskill's clod-crusher, Chandler's liquid drill, Richmond's chaff cutter, Gardner's root slicer, and others equally important, had been fully established among farmers before they received any reward from the Society. He maintained that the time

had come for reserving prizes for great and much-needed inventions or improvements, such as steam-ploughing.

The Secretary announced that on Wednesday evening next, the 16th inst., a paper by Mr. John Underwood, "On the History and Chemistry of Writing, Printing, and Copying Letters, and a new plan of taking Copies of Written and Printed Documents, Maps, Charts, Plans and Drawings," would be read.

Home Correspondence.

APPLICATION OF THE SEWAGE OF TOWNS TO AGRICULTURE.

SIR.—Having lately, in company with Messrs. Moll and Mille, Commissioners from the Minister of Agriculture in France, and some French agriculturists, made a tour to places where the sewage of towns is applied to agricultural production, and visited a number of farms under the liquified manure culture, I am in a position to deal with some serious misrepresentations made by Mons. Barral, a French journalist, the editor of a publication called the *Journal d'Agriculture Pratique*, contained in an anonymous paragraph, extracted from a weekly newspaper, and inserted in the Society's *Journal*, No. 253. As displaying obstructions to science created by objectionable modes, as I deem them, of treating such questions—as well as a matter of justice, I must claim attention to some answers which I think it due to give.

M. Barral puts forth a statement, in relation to incidents of two farms, as affecting the whole principle of culture; the one, a farm at Myer Mill, near Ayr, owned by Mr. P. W. Kennedy, the Manager of the Branch of the Royal Bank of Scotland, and Provost of Ayr; the other, the small farm at Canning-park, occupied by Mr. Andrew Telfer, a merchant, at Ayr, who deals specially in manures.

The paragraph speaks of the "ruined farm" of Myer Mill, and M. Barral states that, "the ruin of Mr. Kennedy, of the liquid manure farm of Myer Mill, Ayrshire, has produced a very unfavourable opinion of the liquid manure system among the farmers." The Mr. Kennedy here mentioned, it is to be presumed, is Mr. James Kennedy, the former manager, a cousin of the owner, who, I was informed, left Myer Mill in consequence of an offer, on highly advantageous terms, of a farm on Sir Robert Peel's estate; and so far from Mr. James Kennedy believing the system to be a failure, he had stipulated for the appliances requisite to carry it out on his new farm. We did not find the new tenant at Myer Mill Farm, but we were informed that, instead of the farm being stopped, as represented, the present occupier was only waiting for the repair of the steam-boiler, and other changes for its conversion from a stock-feeding to a dairy and cheese-making farm, for which the superior quality of the milk attested there, and attested generally at other farms, as being obtained from the produce of liquified culture, would particularly suit it; and specimens of the new cheese were given to us and pronounced to be of high promise.

It was only in the exercise of great courtesy that Mr. Kennedy, the owner, could be prevailed upon to answer inquiries touching in anywise upon representations which he could not but disdain for their want of accuracy, and despise for their ignorance; but he informed the commissioners of the fact, which in itself answers the representation of the ruin of the farm,—that it had been let to the new tenant at double the rent previously paid for it; the improvement, however, comprising new buildings and other works, as well as the new distributary apparatus. Mr. Kennedy further stated, confidently, that if he had

do the work over again, he would make no material change in it, nor would he restrict the distributary apparatus, even over those portions of the farm possessing falls suitable for the distribution by shedding; for the method by shedding had been tried and found to be too slow, and the expense of steam power, instead of being large, was really small, as part of the entire operations. Moreover, that mode of irrigation confined the operation to grass cultivation, which was a serious loss. An intelligent agriculturist, who held the farm after the first manager, had declared, after a ten years' experience, that he did not see that the farm could be advantageously altered.

It may here be mentioned that on another large farm,—that of Mr. Harvey, near Glasgow,—where the distribution is from tanks on the hill tops, by shedding from pipes as by water meadows, but without any expense of surface formation whatever, the tenant declared that he now believed that he should double the effect of his manures if he were to distribute by the jet, in the manner in use at Mr. Kennedy's farm at Myer Mill; and, on a proper examination, without his declaration, it is clear that he might do so; for whilst by the method of the water meadow the surplus manure runs away into the ditches to great waste, the method of distribution requires four or five times more manual labour or time.

Instead of reducing the application of steam power and machinery, as proposed in the case of applications on a large scale, on account of their supposed expense; instead of returning to a method of distribution which occupies the surface for weeks,—from twelve to fourteen days, with from two to three inches deep of liquid, as I am informed by the engineer who laid out Sir Stafford Northcote's catch-water meadows, referred to as models,—the manager of Lord Essex's farm, for the application of the sewage of Watford, and Mr. Worsley, the owner of the land irrigated by jet with the sewage of Rusholme, expressed the opinion that the present occupation of time in distribution, even by the jet, during hours, might be advantageously abridged, and they would prefer augmenting the application of steam power, on account of its assured economy. Instead of its being true that the operation of the Works at Myer Mill had prevented the application of the new principle being followed elsewhere, the commissioners were invited to see one farm in that part of the country, where new works on the same principle are in progress, and several subsequently completed, and they have received a list of thirty-two new farms where new works have been completed, and got into full operation by Messrs. Young, mechanical engineers, at Ayr, since they executed the Works at Myer Mill.

In respect to that part of the paper in which Mr. Barral gives his own account of Mr. Telfer's verbal description of his farm, which Mr. Barral adduces as showing misrepresentation on the following points, in what he calls the official report of the Board of Health:—

"1. The subterranean irrigation system is only applied to half the farm, consequently the cost per acre," he says, "is just double what the Board of Health report states."

"2. No account is taken in the official report of the enormous application of guano, at the rate of 8 and even 16 cwt. per acre. Thus the estimated profits must be reduced by the cost of the guano, about £486 per annum."

Now, if M. Barral has himself read the document from which he professes to quote, which, for his sake, I must presume to doubt, he cannot but have been aware that he was not quoting from the report of the Board of Health, but from one of eighteen appendices, comprising the accounts and views of his Royal Highness Prince Albert, of M. De Candolle, of Bousingault, an account of the irrigations at Milan, by Count Arrivabene, the estimates and plans of different inspectors, not one of whose differing particulars has he any right to assume. In the absence of a distinct recognition, that the Board adopts more than any other. Incidentally, as illustrating the superior quality of irrigated produce, mention is made

that Mr. Telfer obtained two pence per pound more than the current price for his butter, but no estimate is given, nothing is said in the Board's report about his profits, or about the profits of any one else. Whilst in the one account of Mr. Telfer's farm—mis-quoted as the Board's—that of Mr. Lee (for there is another account given of the same farm by the Hon. Dudley Fortescue,) the cost of iron pipes is stated at £2 10s. per acre; in the Board's minutes of information, the cost of "iron pipes and steam power" is stated at £4 4s. per acre,—whilst examples of other plans and charges are given from £3 2s. 6d. to £6 5s. 5d., with different plans, sizes, and lengths, and the prices of pipes, &c., so as to enable any one to form estimates for himself. Indeed, Mr. Lee's paper contains plans and estimates, as well as accounts of different farms and scales of expenditure, such as would correct any mistake made in one item of account of the particular farm selected from the rest, and unwarrantably held forth as if it were one particularly selected, and presented as a general example in respect to the expense of works. Any important error in the account of this particular farm, is due to Mr. Telfer himself, who, I was assured by Mr. Lee, had stated to him, at the time of its publication, that it was in the main correct, and who certainly, in his correspondence with me, never took any exception to it; nor, in the first instance, specified the extensive use of guano or artificial manures, if he did use them extensively at the commencement of his working with the new machinery. It might indeed at that time have been naturally overlooked, for the main question then was not as to the distribution of any one species of manure, but of every species of solid manure, in suspension or in solution in water. The charge against the general Board, couched, by insinuating, against myself, of having ignored the use of guano, and ascribed the whole of the production there to the common farm-yard manure, will be found to be of the same character as the rest of the representations in the paragraph.

If any competent or impartial person will read over the official minutes of information, he will perceive that the main question there treated is, as to the relative economy and efficiency of a new mode of mechanical distribution, in solution or in suspension in water, of solid manures of all sorts, of solid town manures, of solid farm-yard manures, and of guano, as well as diluted urine. By this new machinery, to use the illustration of Mr. P. W. Kennedy, "the land becomes loam, into which we put the raw materials, out of which the crop is manufactured;" and it was shown that it was applicable to almost any species of materials, even to mere sands, of which Mr. Telfer's farm furnished an important example. At page 58 of the Board's minutes, the conditions for the best application of liquified manures, are specified, and it is observed that "farmers who have observed none of these conditions in the application of guano, and have laid it on in bright "windy" weather, have had their manure evaporated by the ship-load, and their money blown away. They have then reported that guano did not answer on their land, and so with other manures. The ordinary effects of guano, Mr. Kennedy states, have been doubled by distribution in solution in water at the right times, by the new distributing apparatus, &c.

In respect to Mr. Telfer's farm, I will call the attention of M. Barral to the following passage, from the statement I made at the Congress at Brussels, and re-published in England, where it could scarcely have escaped the attention of his informants.

"In answer to some general observations of mine on the great advantage the system of liquified manure farming appeared to me to offer under the climate and soil of France, Mr. Telfer, writing to me in May, 1855, says, "I am fully alive to the advantages France possesses over this country in temperature, the most important element in vegetable life. With a moderate temperature all that remains to be supplied is manure and moisture, feed for

the plant in suitable form. This the system of pipeage enables you to furnish in exact accordance with the requirements of the plant. I am satisfied liquified manure could be successfully applied to grain crops in such a country as France, whereas here, from the uncertainty of the weather at harvest, it is accompanied with greater risk. Had I been favoured last year with dry weather during the time my wheat crop was ripening, my yield would have been 100 bushels the Scotch acre," (1½ English), "or upwards of 85 hectolitres the hectare, instead of being confined to a small piece of the field that did not lodge, but on it the average of the field was a high one, 85 bushels. This high average is in some measure to be attributed to the thorough admixture with the soil of the various manures which had been applied in former crops by means of pipes. I am supplying ammonia this season entirely through my pipes, and at one-half the cost I did formerly, as the article can only be used by those who have pipes. I find the supply of manure must be in proportion to your command of moisture, the one being of little use without the other."

"On this I have to observe that whatsoever may be the remaining risk in England in the cultivation of cereals under this method, it is now proved, on various of the new farms to be less than the risk there under the ordinary method. Count Gasparin gives an instance of the production of 70 hectolitres of wheat per hectare in France, but he gives it as a feat. Lord Kinnaird tells me that he has had as much grown on a farm belonging to him in Scotland, as a feat. In this feat of Mr. Telfer he used, as I understood from him, in addition to his farm-yard manure, a large proportion of guano, and his easy advance is due to the new instrument for its distribution in solution as liquified manure; but in other farms, which I think the most important examples, 40 and 45 bushels are given without any foreign or other liquified solid stable dung or diluted stable urine as manure."

Neither would a statement which I made at a meeting held at the Royal Agricultural Society, on the 15th of April, 1855, have probably escaped the notice of Mr. Barral's informant. In the course of that reported statement I observed, "I have visited the farms of forward and successful agricultural improvers during the last year and the year before, who have put their farms under tolerably complete distributary apparatus, who were still using guano or other artificial manures, whilst they had near the cattle sheds heaps of decomposing dung, which ought not to have been there but in dilution, and incorporated in the soil, and whose liquid manure tanks were stinking with the escape of the products of decomposition, denoting the waste which is preventible by putting the manure in its right place, i.e., the soil. One eminently successful improver is a guano merchant, and is to be excused for displaying to the farmers a liquified application on his farm of the powerful effect of his commodity. Another farm manager has also excusable prepossessions in favour of special manures, which he has been moved to try. But the opinion, evidence, and the particular examples to which I advert, justify the objection which I make to the addition of any imported stimuli by the managers, whilst the farmyard itself presents, in the unused dung and in the products of decomposition evolved from the stagnant contents of the tank, the demonstration of the presence" (and escape) "of unused or misused manure."

On the testimony of horticulturists practically experienced in the application of liquified manures, I felt justified in applying these observations to such management as that of Myer Mill, by Mr. James Kennedy, as well as to the management of Mr. Telfer's farm, in the condition in which they were on the occasion of previous visits. The fact stated by Mr. Mechi, that the state of the water in distant water courses has denoted the days of his applications of liquid manures, is, I

apprehend, a demonstration that he applies it wastefully, and that even he has yet to learn to do justice to the principle by more frequent applications, better adjusted to the absorbent powers of the soil. If Mr. Telfer had intended to make such statements as M. Barral reports, e.g., "the liquid manure is only used to wash in the guano. Mr. Telfer considers that its fertilising powers were very slight;" Mr. Telfer observed, "It is only a vehicle for guano; what there is does no harm, but it is quite insignificant;"—Mr. Telfer would have justified the supposition that he, as the chief salesman of guano, and of the artificial manures used within the district, was exalting the powers of the manures he could sell at the expense of those he could not sell. In accepting and putting forth such testimony, to the effect that the liquified manure of 50 head of cattle was of little or no effect, *presque rien*, when applied to 50 or even to 25 acres, could the editor of the *Journal d'Agriculture Pratique* have been aware of the experience of Belgium and Switzerland as to the powers of such manure? Can he have been aware of the recited experience and expositions of Schwyz, on liquified applications of manure, above all of the expositions of his own great countryman, De Candolle, who was, I believe, the first scientific agriculturist to enunciate the conclusion which I cite in his own terms:—"It is to be desired that the practical use of liquid manure, which serves at one and the same time as manure and for watering, should become more universal and popular in a great part of Europe?"

But Mr. Telfer authenticated by his signature a declaration to the Commissioners (much to the same purport, as I understood it, as his letter above cited), that he held no such conclusion as that attributed to him by M. Barral; and he at the same time stated that the account given of the operations of his farm by Mr. Morton, the editor of the *Agricultural Gazette*, was correct, and authenticated by himself before its publication. Now that account is, on the whole, higher than the one given by Mr. Lee (except in its statement as to the quantity of guano, not then specified by Mr. Telfer), which is the subject of Mr. Barral's attack. The intrinsic ignorance implied in such alleged testimony as that above attributed to Mr. Telfer, is only equalled by that implied in the like reported testimony of the owner and of the occupier of the farm at Rugby—that the excreta of a population of some five thousand persons, when conveyed in water, had very little fertilising power! How greatly the testimony of Mr. Walker, the owner, must have been misrepresented, I showed by the testimony of Mr. Walker's own authentic declaration. What the occupier may have said of the manure, in his position of a buyer, I cannot say, but I have a note of his evidence in respect to the value of the manure for sale to a neighbouring farmer, given to Mr. Alfred Dickens, the Inspector of the General Board of Health, on the occasion of an occasional visit by the President, the Right Hon. W. Cowper—"Mr. Campbell pays Mr. Walker at the rate of four shillings per 9,000 gallons; Mr. W. finding pipes, labour, &c. Mr. Congreve," the present occupier, "stated, that to produce the same results with ordinary manure, as those produced by the sewage," as was understood, for a quantity of some four inches, or less than one-third that applied in most of the greater examples of applications of sewage, "would require about twenty loads of the ordinary muck, the cost of which, and putting in, &c., would be about £10 per acre. Mr. Walker said he thought that about 100,000 gallons per acre cost £2, and he puts that sum against £5, which he estimates as about the cost of an ordinary top-dressing."

To any one whose own state of knowledge, applicable to the particular subject, is so low as to render him incompetent to judge of the intrinsic value of any testimony upon it, and to cause him to be held in doubt by contradictions of any kind from any quarter, I repeat that he may easily determine for himself the value of

all conflicts of testimony, by trial works, which he may at little trouble and expense make for himself on his own farm, or in his own garden, by taking equal quantities of stable manure or any other manure, applying one portion in the solid form in the manner of the ordinary top dressing; by putting the other portion in solution in four or five times its bulk in water, and applying the solution to the land by the watering pot, and following up the growing crop, with food in water, in such quantities, and at such times, as a good gardener may advise. But the increased fertilising power of manures applied in solution or in suspension in water, and at once conveyed amidst the soil, and put in chemical combination with it, or applied as food to the growing plant, I must assume to be a general elementary fact or principle, placed beyond dispute, by a concurrent mass of testimony from horticulturists, and from agriculturists at home as well as abroad. The new general elementary fact or principle which I have caused to be established, is a mechanical rather than an agricultural principle,—is the cheap as well as rapid means of applying the fertilising power of liquified or diluted manures or simple water; the power of doing almost for shillings, what by the gardener's watering-pot can only be done with the same rapidity, on the same scale, for pounds.

This elementary fact may be, as it is, evaded; but it is beyond the power of any engineer, however eminent, or of commissions, to gainsay it, unless to their eventual disgrace. The other new elementary facts established, are the power of removing sewage or liquid manure, and of applying it to the soil before advanced stages of decomposition arise, and its permanent retention by the soil in chemical combination.

As I stated the other day at the Public Health Section of the meeting, at Birmingham, of the National Association for the Advancement of Social Science, the progress and position of the question, as applicable to the relief of towns, has close analogies to the progress of railway communication. As stated by Charles Knight, "the earliest railway for public traffic in England, was one passing from Merstham to Wandsworth, through Croydon, a small single line on which a miserable team of lean mules or donkeys might be seen crawling at the rate of four miles an hour, with several trucks of stone and lime behind them. It was commenced in 1801, and opened in 1803, and the men of science of that day,—we cannot say that the respectable name of Stephenson was among them" [Stephenson was then a brakesman at Killingworth]—"tested its capabilities, and found that one horse could draw some thirty-five tons at six miles an hour, and then with prophetic wisdom declared that railways could never be worked profitably." Later on, when a locomotive was seen conveying goods at a rate of more than twenty miles an hour, at a cost of three-eighths of a penny, or less than a halfpenny per ton per mile; or, in other words, when the elementary fact was demonstrated of the practicability of public conveyance more than six times quicker and six times cheaper, than the common method, the cry was still the same, in the face of the demonstration, that it would never answer. And no doubt there have been apparent justifications for their prognostications,—but totally independent of the elementary facts,—as in double and treble expenditures, &c., beyond what is now proved might have sufficed. Lord John Russell has stated that it takes a quarter of a century to get a new simple idea into the public mind of England. In a quarter of a century, when the elementary fact or idea of the cheapness of railway conveyance did get into the mercantile mind, and became established and properly considered, and had superseded all mere opinion evidence, the chief direction of opposition,—and that, too, in the guise of superior wisdom,—was to supersede the first successful plan, not by anything more simple, but by something more complex and obviously dearer, as by substituting the performance of the one engine running, by a multitude of en-

gines which were stationary, by rope or chain, or by atmospheric or hydraulic traction.

In respect to the distribution of town and farm-yard manures, and simple water, the elementary mechanical fact has been established of a power of distribution relatively as cheap and as quick as the railroad compared with the common road conveyance; upwards of 100 tons being proved to be distributable within an hour, at less expense than two shillings, and this elementary fact has been presented in varied demonstrations with engines of different power, chiefly small, all excelling the common method in rapidity and cheapness in distributions at a mile of distance, from a penny to a halfpenny per ton, but in the face of these demonstrations, there are men in scientific position who declared that it could not be worked profitably, that is to say, that it would not answer to do the for fence which is now done for shillings, or to do the in an hour which now requires a day.

The opposition made to the application of this engineering element, to the distribution by jet, on the ground of its expense, reminds me of a story told of the Duke of Bedford, that having urged upon one of his farmers who was ploughing with four horses in line, that good work might be done with two horses properly abreast, the farmer boldly denied the fact; on which the duke got off his horse, unyoked the team, diametrically two, attached two abreast to the plough, took it in himself, and did good work with it; to which practical demonstration the farmer's answer was, "that it might be all very well for his grace, as a duke, to work in that way, but he, as a farmer, could not afford it." This was a farmer of the old school; but here we have the editor of a scientific agricultural journal accepting a story as a fact, and proclaiming it to Europe, that a farm had been ruined by a plan which saves all the liquid manure previously wasted—had been ruined by works which, at an expense of 10s., effect a distribution of 40,000 gallons per diem, or, with the labour of one man at the end of a man and a boy at the hydrants, regularly effect a distribution of upwards of eighteen tons of liquid manure per hour, about a mile distant;—as much would probably be distributed within the same distance within the same time, by some hundred of men by the Swiss method of distribution with the *doosier*! dealing with the established elementary fact, or principle of the fertilising power of such manure, really is of the character of one presented to the notice of the Commissioners, in connexion with the farm of Mr. Harvey, great dairy keeper, near Glasgow, where the urine from the cow-sheds alone sufficed to raise a very large farm a degree of fertility exceeding almost all others in the same district, and enabled him to sell the whole of his dung to other farmers, of whom we were informed, notwithstanding the visible demonstration made a year to year of the fertilising power of the liquid manure, most of the farmers who bought the dung were unable by the visible demonstrations, and continue to allow liquid manure produced on their own farms to continue to run to waste into the ditches and watercourses.

Notwithstanding the imperfections of the first system—some of which, I must confess, present existing in respect to execution of the like humble grade, that of the first railway example at Croydon,—the many elementary principles in question have been so advanced that, as in the case of the early railway progress, the chief efforts in the way of opposition are respects the town manures to obtain substitutes more complex in principle and more costly in application. Under the new system of tubular drainage, now extensively completed in many, and in progress in some hundred towns, all refuse is at once removed, without stagnation, without deposit, before it can enter into an advanced stage of decomposition, and before noxious emanations can be evolved; and it is demonstrated that after constant removal from beneath the sites of houses and towns, it may be even more rapidly applied to agriculture.

production. In the two working examples of Rugby and Watford, the refuse discharged into the house drains at eight or nine o'clock, will, under ordinary circumstances, be upon the land before ten or eleven o'clock, and not merely upon the land in mechanical suspension, but incorporated in the soil, in effectual chemical combination; not merely deodorised, but disinfected. As in the case of the first lengths of railway traction brought into complete operation,—competent and disinterested persons who duly considered them, would see in them the demonstrations of the most extensive applicability, so in these examples of the application of town refuse to agricultural production, no doubt would be entertained that, by the application of the like means, the whole of the morning's refuse of the metropolis might be put in constant removal at the rate of some three miles per hour, and would be inoffensively incorporated in the soil before the nightfall;—that all the necessary works, internal and external, to achieve this result, might be accomplished considerably within the expense required by the official referee's plan of outfalls, to throw the whole of the refuse of the metropolis into the sea.

But the new elementary facts are far too simple for popular, or even, it would seem, for professional appreciation; and greater complexity, more so called "art and genius," and works of greater expense are required. Instead of discharging the refuse from the houses of the poorer and middle classes, it is sought to retain it in *fosses mobiles inodores*. Failures and nuisances in the course of abandonment in France are re-invented and re-patented in England, and agitation is maintained for their introduction. It being thus proposed that the excreta shall be retained in the houses in a decomposing state, deodorizers and disinfectants are to be used, and every house is to have its chemical manipulations with one of the chemical agents; and the conflict is, which it shall be,—whether peat charcoal, sulphite of zinc, or sulphite of magnesia shall be manufactured on immense scales of expense and profit. In respect, however, to house drains, short lengths, with good falls behind the houses, are too simple and too cheap;—kitchen floors are to be ripped up, the front pavement and road-ways are to be broken through for long lengths of drains with bad falls; prolonged divisions of the drains, which increase friction, are preferred, and, even where tubular branch sewers are adopted, sizes are frequently used for two or three houses which would serve for two or three hundred. In the face of the demonstrations of the complete self-cleansing powers of sewers of sizes and shapes properly adjusted to the flow of the sewerage, such large sizes and rough formations are maintained, so as to increase the friction, retard the flow, occasion deposit, and create extended cesspools. Then there are necessary arrangements for intermittent flushings, besides demands and projects for the extensive use of deodorizers and disinfectants to check and mitigate the products of decomposition; elaborate but unsuccessful trappings to protect houses and streets against their escapes, and calls for the construction of immense ventilating shafts, to lead away and diffuse above and spread about the deleterious vapours which it is proved the simple and less expensive works do not generate. When the manure which has been detained, decomposed, and deteriorated at the expense of the inhabitants, arrives, after storms or flushings, at the outfall, its direct application by quick and economical power, is too ample and far too cheap. It is to be arrested and spread out into large sewer reservoirs, there to be subjected to an expensive chemical treatment, which precipitates a portion to be converted into a solid form; which solidified manure must again be put into water, for the development of such fertilising powers as it may contain, the highest of which are not pretended to contain as much as is thrown away on the original solution. At the meeting of the Health section of the Association for the Advancement of Social Science, I asked a projector who brought forward a plan of this species, had he

seen the works tried on the same principle at St. Thomas's, Exeter, which had been abandoned. No, he had not. Had he examined those tried at Croydon and abandoned? No, he had not. Had he examined those nearer, at the works at Leicester, the solidified manure of which had not succeeded; or others on the like plan,—which Mr. Pigott Smith, the surveyor of Birmingham, not inaptly described as an elaborate machinery for obtaining the bran, and throwing away the flour,—a description which a close examination and report by Professor Hofmann, of the College of Chemistry, and other chemists, fully justifies? No; he had not. But he will still persevere, and in despite of the proved elementary principles of success on the one side, and of failures on the other, large capital is invested,—in the instance of Leicester, double that which would have sufficed for a direct application,—in the face of such experience, as that for half a century at Edinburgh, and of the continued letting of inferior applications at £20 and £30 an acre per annum. Agitation is maintained for the depreciation of the principle and practice of liquified applications, and the exaltation of applications of the solidified manufactures, of which it has been repeatedly announced that the records of the Royal Agricultural Society do not furnish one solitary instance of success.

Where these intermediate applications are proposed to be elided, and more direct applications adopted, the evidence of the elementary facts ascertained is still defied. Thus, in respect to the area required, it is now tolerably well ascertained that 100 acres will suffice for the utilisation of the sewage of 500 houses; that for the metropolis, some fifty or sixty thousand acres, about the extent of the Plumstead and the Kentish marshes, would suffice; but one plan demands nine millions of acres, whilst the official referees, more moderate, but still without any justificatory facts, demand one hundred thousand acres. On considerable experience, it is now ascertained that for the complete distributing apparatus, of pipes, hydrants, &c., for the land, leaving it free for arable as well as grass cultivation, an average expense of £5 per acre (or the average expense for permanent works, of one year's ordinary top dressing) will suffice;—that with this apparatus, thirteen or fifteen inches of liquified manure will produce as great an effect as sixty inches thrown on by the old method of submersion;—but in the face of this experience (*v. ante*), the formation of water meadows, at the expense of £12 per acre, is preferred, leading to the conversion of extensive sewer marsh surfaces, with additions of works, leading to an estimated expenditure of no less a sum than £75 per acre.

"It must not be expected," says the Archbishop of Dublin, "that reason will universally make its way. '*Medicamenta*,' says the medical aphorism, '*non agunt in cadaver*.' Those in whom indolence is combined with pride, will be induced by the one to remain in their position, and by the other to fortify it as they can." The exposition of the misdirected interests that stand in the way of science, and actively impede the progress of practical art, could only be made at much length, and I will, in conclusion, only refer to that part of M. Barral's paper wherein he alleges that the "ill repute of the Board of Health in England has especially arisen from the heavy expenses which it has imposed upon towns for the express purpose of applying their sewage to agricultural purposes, the result having rarely (never) answered the promise made by Mr. Chadwick, and that the ruin of Mr. Kennedy, of the liquid manure farm, Myer Mill, &c." Passing by the allegation of the unpopularity of the Board, who received petitions from upwards of two hundred and eighty towns for its intervention, and whose ordinary functions were exercised in the main upon voluntary applications; it is not correct to allege that Mr. Chadwick has pretended to make any personal promises whatsoever, either as to the application of sewage, or of farmyard manures. As to their productive powers, the promises really made were tho-

contained in the evidence cited, of De Candolle, of Schwert, and of eminent English agriculturists, of the experience at Milan, and the continued letting of the Edinburgh water meadows at £20 per acre or more. As to the mechanical powers of distribution, the promise made was mainly on undisputed trial works, easily repeatable, and on the cited facts adduced by engineers, who will be found to be of pre-eminent distinction in the comparative closeness of this expenditure to their estimates. The promises put forth on such evidence, of which all might judge for themselves, will be found to have been everywhere realised, in proportion as the evidence itself has been adhered to. Mr. Barral may judge of the sort of hands into which he must have fallen, from the fact that not a single town made any practical application of the kind whatsoever, or was known to have incurred any expenses of the kind, or was called upon or could be compelled by the Board to do so, the Act having given to it no compulsory powers for the purpose. It was, however, a matter of extensive request from local authorities that such powers should be provided to be exercised by the Board in their behalf for the removal of obstructions which still prevail against those who have mastered the subject. "Minutes of information" were prepared and issued for the guidance of voluntary efforts, such as those made by the Earl of Essex for the application of the sewage of Watford, and those by Mr. Walker for the application of the sewage of Rusholme.

I feel justified in calling upon M. Barral to name his authority for the statements above made, for I have no doubt that the source will be found befitting the feelings of exultation manifested at the obstruction or frustration of labours directed to the prevention or mitigation of some of the heaviest inflictions on mankind.

I am, &c.,

EDWIN CHADWICK.

THE SMOKE QUESTION.

SIR,—Not having had an opportunity of replying to the various observations made upon my paper on Wednesday evening last, I shall feel obliged by your inserting the following in the next week's *Journal* of the Society. I may congratulate the meeting that my paper elicited so much valuable information from the various speakers, several of whom rather misapprehended the drift of my facts and arguments; by the former both in glass furnaces and several steam-engine boilers, viz., three at the Phoenix gas works, and one at the Falcon glass works, it has been proved beyond the question of a doubt, that coke, taken fresh and dry from the gas retorts to the furnaces, has given rather more heating power at the rate of one chaldron, than one ton of small Newcastle coal, without smoke or injury to the bars or boilers.

Mr. Greaves's experience of the advantages of gas coke being inferior to mine, arises most probably from his coke not having been fresh, perhaps wet and somewhat broken by exposure and conveyance in open barges, which, I have reason to believe, would deteriorate gas coke to the extent of 15 to 20 per cent. Mr. Fothergill's remarks upon coke being inferior to coal for locomotives, refer probably to anthracite coal (or coal of that class), which is but a more close (less porous) and aggregated form of carbon than coke. Coke is usually bought (and ought to be bought) by measure. It is, however, a good check as to strength, to have a test by weight also, as, in case of its proving much less in weight than 13 cwt. per chaldron, an increased quantity ought to be allowed to the consumer. I had great difficulty in persuading Mr. Frederick Pellatt to try coke in such large proportions as 19 of coke to one of coal, but complete success attended his first week's trial, and he has never since been disappointed. If Mr. Quick and Messrs. Doulton would

double their proportion, viz., two-thirds of coke, I have no doubt of its success, as the one-third bituminous coal would, I believe, have sufficient carrying power. If Mr. Stevens had noticed that my paper in no case advocates the use of coke without some small coal, his question would have been unnecessary. It is sufficient to observe that where long fires in boilers require carrying fuel, more small coal should be added to the coke. With respect to his "dissent from my general conclusion," he seems to have omitted in his calculation the gas, which very greatly exceeds in value the fuel used for its generation, and which would have made all the difference in his Dr. and Cr. account, which, however, in any case, would be no disparagement to my facts, viz., that when manufacturers can get cheap and fresh gas coke in their locality, it may be used in large or lesser proportions with economy, &c. Mr. Patrick Buchan, then present, would have stated, had he the opportunity, what he has since communicated to me by letter, that at the Crewden Iron Works, of which he is manager, in Ireland, "The coal is highly carbonaceous, burns with a yellow smoke, and contains 70 per cent of coke. Practically, we get that return from our coking ovens. For the sake of economy in carriage, we coke it and throw away its gaseous and other parts. We should use 3 tons of coal in making a ton of iron; the equivalent would be 40 to 45 hundredweight of coke, but, bearing out your observation, it really amounts to 35 to 38 cwt." So that it appears that coke for smelting iron on a large scale has been about 13 cwt., or one chaldron, against one ton of bituminous small coal, practically confirming my experiments on a large scale, for raising steam and melting glass in ordinary furnaces.

I am no enemy to the use of machinery or inventions for preventing the smoke of bituminous coal, which should be used where coke or anthracite cannot be bought cheaply. I mentioned that Messrs. Doulton have a steam-engine boiler of almost Cornish dimensions, with a fire-place in the centre, like a marine boiler, with two dampers, one for the ingress and another for the egress of the air, with ample throat, and still more ample chimney, the thick door of the furnace being perforated with numerous small holes, which separate and heat the entering air, but which, being afterwards closed by outside shutters, when the gases were burnt off from a charge of coal, the air entered only through the bars below. The heat was greater than that of a Cornish furnace, and was working ordinary coal smokelessly with a consumption only of half a ton for 10 hours daily, though the engine did the work of from 25 to 30 horses.

For house purposes the celebrated Dr. Arnott has a close stove, burning coke day and night with remarkable economy, his estimate being about one ton per annum; he has also open stoves, partly for coke and coals, which give a good heat at about two tons per annum, say one ton of each, and could be kept burning, were it necessary, all the year through smokelessly.

Should legislation ever be extended to private houses, the Doctor's principle and inventions for adapting the supply of air to the consumption of the fuel would be more largely adopted.

When small coal only was used as formerly in a glass furnace, the smoke was intensely dense, even with careful stoking, and when a charge was put on, such an immense quantity of gas and smoke was produced as for a short time checked the heat of the furnace and lowered its temperature, (as ammonia water is stated to do when converted into steam within gas retorts). The large portion of the coke used (with only a 20th portion or more of coals) checks the heat infinitely less than coal when thrown on, and no skill of the stoker is comparatively necessary, as he could hardly cause smoke with coke fuel if he desired it. Mr. Hyde Clarke is mistaken in supposing the small coal was *stale* and badly stored, as it always came from the London coal-merchants as soon as sifted, and was at once placed before the furnace for use. It appears that he (Mr. Clarke) tried coke in his

establishment, for raising steam, without success; so did Mr. F. Pellatt, and did not succeed till he enlarged his furnace, &c., to the dimensions adopted by Mr. Innes, at the Phoenix Gas Works.—I am, &c.,

APSLEY PELLATT.

Staines, Dec. 5, 1857.

DRAINAGE AND UTILIZATION OF SEWAGE.

SIR,—Last year I submitted to the Sewage Commissioners certain suggestions. Moderate towns, of about fifty thousand inhabitants, could be drained by one underground sewer, and its branches. London, containing, say, three millions of people, should be subdivided into longitudinal sections, at right angles with the river, so that every section may contain about 50,000 people, as near as the undulations of ground and deviations of present channels would admit. About sixty channels would thus open into the Thames, north and south, each being discharged separately by its own individual motive power. I propose that every separate section of 50,000 inhabitants, shall discharge its own sewage into 10 or 20 tanks, say of 1,000 tons each, their tops to be on a line with the lowest level of the present outfall. Twenty such galvanized iron or timber vessels could be easily worked, *per se*, by a few common labourers. Sixty distinct tanks, of 20 tons capacity each, will take in a total average of about 1,200 tons, or about 212,800 gallons.

This will give time for the rapid precipitants to purify the water, which is to be shot off clear into the river, at an average pressure of 20ft. at low water, and of 30 feet at high tides. The sediment could be pressed out again for use.

Deluges of rain storms could, in great part, be conveyed riverwards, along many street or surface channels, and in certain localities a few existing drains could be maintained clear, for the transit of storm floods only.

It is by the variety of gases generated in the manufacture of the phosphates and ammoniates, that motive power is gained; it is by the action of these gases in close tanks that smells are abated. Bi-carbonate of magnesia is produced in the tanks, or in separate vessels, and these materials, acids and carbonates, phosphates and ammoniates, form heavy and nearly insoluble triple phosphates, made to subside in the vats so rapidly that the clear and scentless water may be discharged into the Thames after 6 hours' subsidence of its silt. In ordinary cases, steam is the best motive force, but it contributes no *quality* to liquids. It cannot work well except by the intervention of machinery. But one or other of the gases here mentioned constitutes its own piston, to drive water down in vats and up in shafts, and to discharge pure water into rivers, whilst collecting sediment, equal to guano, on the bottoms of the vats. In some cases it is better to mingle the chemical materials and their results among liquid manures or sewage, and to force them constantly, without subsidence or delay, to rural districts for irrigation.

I am, &c.,

JAMES MURRAY.

MEETINGS FOR THE ENSUING WEEK.

- Mon. Architects, 8.**
Geographical, 84. I. Mr. Galton, "On the Exploration of Arid Countries." II. Mr. Moffatt, "Journey in the Bushman and Namaqua Land, South Africa." III. Latest Accounts of the fate of Dr. Vogel, Central Africa. IV. M. Brun-Rollet, "On the White Nile."
- Tues. Civil Engineers, 8.** Annual General Meeting.
- Pathological, 8.**
- Statistical, 8.**
- Wed. London Inst., 7.**
Society of Arts, 8. Mr. John Underwood, "On the History and Chemistry of Writing, Printing, and Copying Letters, and a new plan of taking Copies of Written and Printed Documents, Maps, Charts, Plans, and Drawings."
Geological, 8. I. Mr. J. Prestwich, "Note on the Boring through the Chalk at Harwich." II. Mr. R. Godwin-Austen, "On a Granitic Boulder out of the Chalk at Croydon, and on the Extraneous Rock Fragments found in the Chalk." III. Mr. C. J. F. Bunbury, "On the genus *Neurospira*, from the Coal Measures."

Thurs. Philosophical Club, 84.

- Naturalistic, 7.
Antiquaries, 8.
Chemical, 8. Rev. J. G. Macvicar, "On a new Maximum and Minimum Thermometer."
Linnæan, 8. I. Mr. Solater, "On the Fauna of New Guinea." II. M. Fée, "On the nomenclature of the genus *Bygonia*." III. Mr. F. Muller, "Report on the Botany of the North Australian Expedition."
Philological, 8.
Royal, 84.
Sat. Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, November 27.]

- Dated 3rd November, 1857.*
2787. Stanislas' Hoga, Charlotte-street, Fitzroy-square—Improvements in electric telegraphs.
- Dated 11th November, 1857.*
2845. Peter Madden, 1, Russell-place, Dublin—Improvements in kilns for drying corn, malt, or other granular substances, part of these improvements being applicable to the screening or sifting of such substances during the process of drying.
2847. Otto William Wahl, 27, Leadenhall-street—Improvements in manufacturing farinaceous products from potatoes. (A communication.)
2851. Joshua Williams, Neath, Glamorganshire—An improvement in coupling and connecting carriages on railways.
- Dated 13th November, 1857.*
2853. James Stevenson, jun., Glasgow—Improvements in lighting apartments and passages.
2856. Stanley Webster, Bolton-le-Moors—Certain improvements in machinery or apparatus for tanning.
2857. George Tomlinson Bousfield, Loughborough-park, Brixton—Improvements in castors. (A communication.)
- Dated 13th November, 1857.*
2861. Angulsh Honour Augustus Durant, Conservative Club, St. James's—An improved apparatus for husking and winnowing castor seeds for the purpose of obtaining the larger quantity and a purer kind of oil therefrom when pressed than heretofore with the outer skin or cuticle on.
- Dated 14th November, 1857.*
2863. George Haseltine, Washington, U.S.—Improvements in machinery for the manufacture of small metallic chains. (A communication.)
2866. James Henry Bennett, 8, Vambrugh-place, Leith—Improved compound safety valves.
2867. Alfred Vincent Newton, 64, Chancery-lane—Improvements in apparatus for retarding and stopping the progress of railway trains. (A communication.)
2869. John Fereday, Wolverhampton—An improved form of steam engine.
- Dated 16th November, 1857.*
2871. Jean Baptiste Donas, 36, Rue de l'Ecliquier—A new optical instrument, which he calls "physioscop."
2873. John Edward Hodges, Leicester—Improvements in the manufacture of looped fabrics.
2875. James Taylor, Birkenhead—Improvements in dredging machines, which improvements are also applicable to other purposes.
- Dated 17th November, 1857.*
2877. Thomas Field, Spring place, Kentish-town—A new method or mode of, and appliances for, submerging submarine telegraph cables.
2881. William Pidding, Southwark-bridge-road—Improved manufactures and improvements in the manufacture of plied fabrics, or of mosaic or tessellated textile and other fabrics, and improvements in some of the machinery or apparatus necessary to produce them, also the application of certain existing or known machinery or apparatus for their production.
2883. Solomon P. Smith, Crescent, New York, U.S.—Constructing iron wheels for railway carriages and similar purposes.
2885. Richard Archibald Brooman, 166, Fleet-street—Improvements in gas burners. (A communication.)
2887. Edward Daniel Johnson, Wilmington-square—An improvement in the construction of fuzee watches.

INVENTION WITH COMPLETE SPECIFICATIONS FILED.

2901. Henry Davis Pochin and James Woolley, Manchester—Improvements in the manufacture of gum or dextrine from amyaceous substances.—19th November, 1857.

[From Gazette, Dec. 4, 1857.]

- Dated 15th October, 1857.*
2641. Henry Angelo Ludovico Negretti, and Joseph Warren Zambrà, Hutton garden—Improvements in producing graduated scales, and other signs, letters, numerals, characters, and pictorial representations, upon porcelain and other ceramic and enamelled materials, which improvements are applicable to the graduated scales of meteorological and other philosophical instruments.
- Dated 19th October, 1857.*
2676. Benjamin Garrey, Asland, New York, U.S.—Improvements in apparatus for determining position and direction on land and sea.

Dated 2nd November, 1887.

2780. Nelson Matthews, Dodworth, near Barnsley, York—Improvements in pumps.
 2782. Mathieu François Isoord, Paris—Improvements in producing heat and light.

Dated 3rd November, 1887.

2788. James Mallison, jun., Bolton-le-Moors—Certain improvements in 'gassing' yarns and textile fabrics, and in the apparatus connected therewith.
 2790. William Joseph Curtis, 1, Crown-court, Old Broad-street—Improvements in machinery used for slotting, boring and surfacing.
 2792. Henry Kinsman Sweet, Northumberland-street, Strand—Improvements in photographic portraits and pictures. (A communication.)
 2796. John Selthen, Earl-street—Improvements in machinery for cutting cork.

Dated 4th November, 1887.

2798. William Fothergill Batho, and Eugene Moritz Baner, Salford, near Manchester—Improvements in machinery or apparatus for drilling and boring metals, and also for cutting key ways and cotter holes.
 2800. James Murphy, Newport, Monmouthshire—Improvements in the permanent way of railways.
 2802. Charles Edward Amos, the Grove, Southwark—An improved arrangement of steam machinery for driving rotary pumps.
 2804. James Houghton, Kilburn—An improvement in braces.

Dated 5th November, 1887.

2808. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in treating iron ores.
 2810. Henry Beinhauer, Deuts, near Cologne—Improved machinery for drawing or extracting water from mines, wells, pits, or other deep places by means of suction.
 2812. Heinrich Hochstetter, Darmstadt—An improved machine for the manufacture of matches.
 2814. Henry Robinson Palmer, Lambeth—An improved stamping and endorsing machine.

Dated 6th November, 1887.

2816. Robert Ker Aitchison, New North-street—An improved break, applicable to wheeled carriages.
 2818. William Anderton, Ince-within-Mackerfield, Lancashire—New railway chairs.
 2820. William Macnab, Greenock—Improvements in vessels propelled by screw or other similar propellers.

Dated 7th November, 1887.

2822. John Fordred, Stoke Newington—Improvements in treating and purifying water.
 2824. John Adams, Queen's-road, Dalston—Improvements in revolver fire-arms.

Dated 9th November, 1887.

2826. Peter Brotherhood, Chippenham—Improvements in boilers and furnaces.
 2828. Daniel Stothard, Lambeth, Joseph Jones, Southwark, David Jones and Benjamin Woolf Jones, Spitalfields—An improved ship's block.
 2830. John Pinker, Pease-street, Hull—Improvements in governors for marine steam engines.
 2832. Alexander Parkes, Bath-row, Holloway-head, Birmingham—Improvements in the manufacture of nails.
 2834. William Jekin Elwin, Dartford, Kent—Improvements in night-lights.

Dated 10th November, 1887.

2838. Charles Eugene Lecoq, Paris—A new mode for advertising.
 2840. Alexander Parkes, Bath-row, Holloway Head, Birmingham—Improvements in the manufacture of tubes and cylinders of copper and alloys of copper.
 2842. Josiah Harrington, 9, Gloster-place, Brixton-road—Improvements in apparatus for pointing pencils or marking instruments.

Dated 11th November, 1887.

2844. Henry Thompson and Samuel Thompson, Regent-street—Improvements in the construction of piano-fortes.
 2846. John Richard Cochrane, Glasgow—Improvements in the treatment or manufacture of ornamental fabrics.
 2848. Isaac Taylor, Stanford Rivers—Improvements in apparatus used in printing calico and other fabrics when cylinders are employed.
 2850. Albert John Davies, 29, George-street, Hanover-square—A protective sandal for bathers, which may also be adapted as an auxiliary for swimmers.

Dated 12th November, 1887.

2852. Ebenezer Coleman, Dudley, Worcester—An improvement in lathes for turning bolts, screws, and other small articles in metal.
 2854. Françoise Honorine Felicie Bertrand de Sivray, Paris—Certain improvements in the construction of bedsteads.
 2856. William Pickling, Lambeth—An improved method of, and apparatus for feeding steam-boilers with water.

Dated 12th November, 1887.

2858. William James Gifford, 38, New Mile-end-street—Improvements in the making, reeling, and working of sails, and in the construction and arrangement of masts, spars, and rigging, for ships and boats.

2860. William John Macquorn Rankine, University of Glasgow—Improvements in fan-blowers.

2862. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the treating and smelting of iron ores, and in obtaining products therefrom.

Dated 14th November, 1887.

2864. George Priny Wheeler, Abbingall, near Miffelsheden, Gloucestershire—Improvements in the preparation of materials for the manufacture of paper pulp or half stuff.
 2866. John Macintosh, North Bank, Regent's-park—An improvement in preparing telegraphic wire, which is coated with gutta percha, in order to render it more capable of resisting heat, and in laying down telegraph wires in the sea.
 2868. Michael Henry, 77, Fleet-street—Improvements in electric and galvanic conductors, and in the mode of, and machinery for, apparatus for manufacturing the same. (A communication.)

Dated 18th November, 1887.

2869. John Tinker, Staly-bridge, Cheshire—An improved sining matter.
 2891. Frederick Ayckbourn, 4, Lyon's-inn, Strand—Improvements in birdcages.

2893. Adolphe Ambroise Salomon-Cohen, Paris—Improvements in machinery or apparatus to be employed in the manufacture of drain pipes and other like articles from plastic materials.
 2895. Major Booth, Manchester, and James Farmer, Salford—Improvements in machinery or apparatus for stiffening, drying, and finishing cotton, linen, woollen, and other woven fabrics.

Dated 19th November, 1887.

2899. Marc Antoine François Mennens, 4, South-street, Finsbury—An improved washing and drying apparatus. (A communication.)

2903. Seth Gill and Henry Newton, Liverpool—Improvements in obtaining stereoscopic pictures.

2906. William Clay, Liverpool—Improvements in the points, switches, and crossings of the permanent way of railways.

2909. John Clarke, Shiffnal—Improvements in the construction of shafts and poles for cars, omnibuses, and other vehicles.

2911. John Cope, Birmingham—Improvements in buttons.

2915. Clement Lawrence West, 26, Rupert-street, Haymarket—Improvements in window sashes. (A communication.)

Dated 20th November, 1887.

2917. Joseph Denton, Pendleton, near Manchester—Improvements in looms.

2921. Henry Bessemer, Queen-street-place, New Cannon-street—Improvements in the manufacture of iron and steel.

Dated 21st November, 1887.

2923. Thomas Glover, Upper Chadwell-street, Myddleton-square, and Alexander Bain, Fetter-lane, Holborn—Improvements in electric telegraphs.

2924. Gerd Jacob Benson, Christiana-street, St. George's-in-the-East—An improvement in the manufacture of moulded sugar.

2927. Jean Marie Auguste Eugene Fabart, Paris—Improvements in looms for weaving.

Dated 23rd November, 1887.

2929. Samuel Riley, 14, Victoria-terrace, Victoria-street, Manchester—An improvement in the preparation of chocolate and cocoa.

WEEKLY LIST OF PATENTS SEALED.

December 4th.

1872. Victor Blumberg.
 1888. James Morris.
 1890. Thomas George Shaw.
 1894. Edward Hirst Hudson.
 1897. Edward Edwards.
 1826. Maxwell Miller.
 1828. Thomas Humphrey Roberts.
 1832. Etienne Lemolne.
 1734. Lambert Cowell.
 2034. Julius Schoneemann.

December 8th.

1601. Donald Bethune.
 1604. John Bickford.

1613. Rich. Archibald Broomean
 1618. George Mumby.
 1823. James Brown.
 1629. George Sampson, Joseph Sampson, & Elijah Ledger.
 1638. Daniel Joseph Daly.
 1645. Joseph Whitworth.
 1661. Edward Brasier.
 1663. Etienne Cominal.
 1664. Thomas Moreton Jones.
 1667. Thomas Heaton.
 1672. Frederick Levick, junior.
 1718. John Dunsell Garrett.
 1984. John Henry Johnson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

December 1st.

2857. George Ferguson Wilson & John Chase Craddock.

December 2nd.

2594. Nathaniel Johnston.

December 3rd.

2624. Samuel Fisher.

December 5th.

2571. James Edward McConnell.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4636	Dec. 8.	The Chain Pocket to prevent picking and cutting...	Stopford Jones.....	78, High Holborn.

Journal of the Society of Arts.

FRIDAY, DECEMBER 18, 1857.

EXAMINATIONS.

The following resolutions have been received from the Institutional Association of Lancashire and Cheshire :—

Resolved unanimously,—

"That the Council of the Institutional Association, in addition to their own Examinations, undertake to conduct the preliminary local Examinations of the Society of Arts, and also to supervise the working of the papers for the Society's Examinations."

"That the Council of the Institutional Association strongly recommend the Council of the Society of Arts to allow the preliminary Examination for 1858, in Lancashire and Cheshire, to be held in Easter week, six weeks before Whitsuntide; the report to be furnished to the Council within one week of the days of Examination, or not less than five weeks before Whitsuntide, and for the following reasons specially applicable to 1858 :—First, That the pupils in the evening classes, in our Institutions, may have sufficient notice to prepare themselves for Examination; and, secondly, because the present depressed state of trade in the manufacturing districts materially retards the progress and efficiency of the classes in the Institutions in Union in Lancashire and Cheshire."

FIFTH ORDINARY MEETING.

WEDNESDAY, DEC. 16, 1857.

The Fifth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 16th inst., Mr. Thomas Winkworth, V.P., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Blackwood, James	Lethely, Henry, M.D.
Blaine, Delabere Robertson	Milnes, William
Haines, Henry	Nightingale, Charles

The Paper read was :

ON THE HISTORY AND CHEMISTRY OF WRITING, PRINTING, AND COPYING INKS, AND A NEW PLAN OF TAKING MANIFOLD COPIES OF WRITTEN AND PRINTED DOCUMENTS, MAPS, CHARTS, PLANS, AND DRAWINGS.

By JOHN UNDERWOOD.

Prior to the invention of printing, when all the business of the world was carried on in writing, and its literature and science deposited in manuscript, the manufacture of a black and durable ink was evidently not only of the first importance, but was recognized as such; and that we have seriously retrograded in this, as well as in many other branches of the Arts cannot be denied; in proof of which we have only to refer to the manuscripts in our possession, when we find that those from the 5th to the 12th century, notwithstanding their greater age, are in a far better state of preservation than those of the last four centuries; for while the writing in the former is always perfect, and, in many cases, as black as if it had just been written, that in the latter is often really not legible.

The grounds for this disparity arise partly from the spirit of competition, so rife in the present day, which is always looking after the cheapest article that can be obtained, and also from the rapidity with which it is thought necessary to carry on all business transactions, and which does not allow time for the use of the comparatively thick ink of ancient times; but when we think of the enormous amount of property that depends, for its proper transmission, upon the permanence and durability of the ink used in the preparation of title-deeds, wills, &c., I consider that no expense of time or money ought to weigh with us in so preparing them that they shall be unalterable by either age or the skilled arts of those who may desire fraudulently to tamper with them.

Many experiments have been made with a view to discover the composition of the ink of the ancients, and the results arrived at from analysis are apparently opposed to each other. The first chemist who devoted his attention to such analysis was Dr. Lewis, to whom we are indebted for much of our present knowledge upon this subject, and who has left us an article upon it full of valuable research in the "Philosophical Commerce of Arts," published in 1768. From his analysis, he comes to the conclusion that the ink of the ancients consisted entirely of fine lamp black or charcoal, held in suspension by some mucilaginous fluid; which opinion was afterwards supported by the experiments of Mr. Thomas Astle, author of a work "On the Origin and Progress of Writing," published about the year 1780; but this view does not at all accord with the results of experiments made by Sir Charles Blagden, which were embodied in a paper read before the Royal Society, in 1787. He states that he had been led to inquiry on this subject by his friend Thomas Astle, who supplied him with several manuscripts dated from the 9th to the 15th century inclusive, some of which were still very black, while others varied from pale yellow to different shades of dark yellowish brown. All the documents he experimented upon, with one exception, agree in the general result, showing that the ink employed in these manuscripts, was of the same nature as that in present use. The letters turned of a reddish or yellowish brown on the application of alkalies; were rendered pale, and at length obliterated, by the dilute mineral acids, and the drop of acid liquor which had extracted a letter changed to a dark blue or green on the addition of a solution of prussiate of potash; moreover, the letters were changed to a deeper tinge by the infusion of galls. Hence he asserts that it was evident one of the ingredients employed was iron, which there was no reason to doubt was joined with vitriolic acid; while the colour of the more perfect manuscripts, which in some was a deep black and in others a purplish black, together with the restitution of that colour, in those which had lost it, by the infusion of galls, sufficiently proves that another of the ingredients was an astringent matter. No trace of a black pigment of any sort was discovered, the drop of acid which had completely extracted a letter appearing of an uniform pale ferruginous colour, without an atom of black powder or other extraneous matter floating in it. One of the specimens sent to him by Mr. Astle, proved very different from the rest. It was said to be a MS. of the 15th century, and the letters were those of a full engrossing hand, angular, without any fine strokes, broad, and very black, on which none of the above reagents produced any considerable effect; most of them rather seemed to make the letters blacker, probably by cleaning the surface, and the acid, after being rubbed strongly on the letters, did not strike any deeper tinge on testing with the prussiate of potash. Nothing had any sensible effect, he found, towards obliterating these letters, except what also took off part of the surface of the vellum, when small rolls, as of a dirty matter, were to be perceived. It is, therefore, unquestionable, he continues to say, that no iron was used in this ink, and, from its resistance to the chemical solvents, as well as a certain dotted appearance in the letters when.

closely, and, in some places, a slight degree of gloss, there was little doubt, in his opinion, that they were formed with a composition of black, sooty, or carbonaceous powder and oil, probably something like our present printer's ink, and, from these results, he was led to suspect that these marks were actually printed. It is said that a subsequent examination proved this to be part of a printed book.

From these experiments, and with the belief on his mind that this latter document must have been printed, he concludes that ancient inks had no carbon in them, and that their greater durability depended upon the better preparation of the parchment or paper upon which the writing was made. The fact that the tinge of colour produced by the action of prussiate of potash seemed less deep than that produced by its action upon inks of more modern date, led him, also, to the belief that there was a less quantity of iron, in proportion to the astringent matter, than is used in the present day. So generally did he believe iron to have been used in the inks of ancient times, that he recommends for general adoption the use of prussiate of potash, combined with a mineral acid for reproducing writings which have been effaced by age. Indeed, in support of the view that iron was generally used in the manufacture of these inks, we find Camparius, who wrote on the subject of inks at Venice, in 1619, recommending the use of an infusion of galls in white wine for the restoration of faded MSS.

Though at first sight the experiments of Dr. Lewis and Mr. Astle seem at variance with those of Sir Charles Blagden, yet, I think, they will both serve to support a view of my own, that in the ink of the earlier centuries of the Christian era, no uniform receipt was adopted, but while in many cases it was purely carbonaceous, yet it generally consisted of a black dye, very similar to our ink, with the further addition of a large quantity of lamp black, or finely-powdered charcoal. It will be found that neither Lewis nor Astle give us the method of chemical analysis which they adopted, and, therefore, we may suppose that with the preconceived notion that the ink was simply carbonaceous matter held in suspension in some mucilaginous fluid, when their experiments proved the presence of pure carbon in the writing, they did not sufficiently prosecute their researches to discover the iron, but decided at once that it was simply what they had previously supposed. Relative to the experiments of Blagden, it must be borne in mind that we do not know on how many specimens he experimented, but we do know that none of them were of earlier date than the ninth century, and, although in some he did not find any trace of carbon, yet in one of them its presence was most clearly proved, and the tests for iron he does not say produced no effects upon it, but no considerable effects, and with regard to his suspicion that this latter was a printed document, I cannot conceive that he was correct, because, if so, it must have shown the indentation of the type: moreover, printing was hardly so far advanced at that time as to be such a perfect fac-simile of writing, as to deceive a person of Dr. Blagden's knowledge and research throughout the series of microscopic investigations which his experiments required. It must be remembered that it was not the appearance of the writing, but the chemical difference of the ink that first led him to suspect that the words were printed and not written.

From experiments I have made with inks composed of black dye and the lightest lamp-black, I find the great obstacle to their use is the difficulty of keeping the carbon in suspension, and knowing when it is so, for, if not frequently agitated, the carbon settles down, and, the colour of the ink not depending upon it, you continue your writing, little thinking that it is quite destitute of the principle upon which its permanence depends. I conceive it to be possible that in many of the MSS. of former days the writing might be destitute of carbon through the carelessness of the writer in not seeing that the ink was shaken, and I think we may fairly conclude

that such was the case with those MSS. in which Dr. Blagden could discover no trace of carbon. Again, if Dr. Lewis and Mr. Astle were correct in saying that all the ink of the earlier ages was composed of lamp-black which new changes its appearance, how are we to account for the various tints of colour which those deeds exhibited. Mr. Astle refers to the following curious case, showing the various changes of tints which the ink of one period has undergone, and it does not seem to have occurred to him that this case militates most strongly against his own opinion. He tells us that he had in his possession a long roll of parchment, at the head of which was a letter that had been carried over the greatest part of England by two devout monks, requesting prayers for Lucia de Ven, Countess of Oxford, a pious lady, who died in 1118. The roll consisted of many skins of parchment sewed together, all of which, except the first, contained certificates from the different religious houses that the two monks had visited them, and that they had ordered prayer to be offered for the Countess, and had entered her name in their bead rolls. He says, "it is observable time has had very different effects on the various inks with which these certificates were written. Some are as black and fresh as if written yesterday, while others are changed brown and some are of a yellow hue."

Now, I am inclined most strongly to contend that if those signatures had been made with a purely carbonaceous ink, they could not have changed to a yellow hue, while I do think it, nevertheless, highly probable that in all, or most of them, carbon had been used, although in some cases it might have settled to the bottom, and not been taken up by the pen. Some of the MSS. at the British Museum give remarkable support to my opinion, for on closely inspecting them it will be seen that while some words and letters, even parts of letters, have retained their full depth of blackness, yet the remaining parts of these letters are of a yellowish colour, in some places with black particles in them, and in others without a trace of any black matter, and so regularly does this remarkable change occur throughout some of the MSS., that by noticing where the blackness commences and runs off to pale yellow, you can almost point out every place where the pen has been freshly dipped into the ink, showing beyond a doubt that such writing was done with an iron ink that had free carbon in it, but, through want of care in keeping it agitated, there was not sufficient carbon for it to be distributed through all the letters. The statements of Pliny and Dioscorides also confirm me in my view. Pliny discoursed on so many subjects, of which he had no practical knowledge, that his remarks are often difficult to understand, yet both he and Dioscorides plainly tell us that the Romans and Greeks used inks made otherwise than from lamp-black and charcoal, and, as Dr. Lewis and Mr. Astle, as well as the authors of articles in many of the encyclopedias, tell us, that both these ancient writers support this view, that the only inks used in former times were carbonaceous, I will here give the literal translation of their remarks on the subject.

We read in Pliny's natural history, "Atramentum, too, must be reckoned among the artificial colours, although it is derived in two ways from the earth. For sometimes it is found exuding from the earth, like brine of salt pits, while at others an earth itself, of a sulphurous colour, is sought for the purpose. Painters, too, have been known to go so far as to dig up half-charred bones from the sepulchres for this purpose; all these plans, however, are new-fangled and troublesome, for this substance may be prepared in numerous ways from the soot that is yielded by the combustion of resin or pitch, so much so, indeed, that manufactories have been built on the principle of not allowing an escape of the smoke evolved by the process. The most esteemed black, however, that is made in this way, is prepared from the wood of the torch pine. It is adulterated by mixing it with the ordinary soot from furnaces and baths, a substance which

is also employed for the purpose of writing. Others again, calcine dried wine lees, and assure us that if the wine was originally of good quality from which the colour is made, it will bear comparison with that of Indicum.

"Polygnotus and Micon, the most celebrated painters from Athens, made their black from grape husks, and called it Triginon. Apelles invented a method of preparing it from burnt ivory, the name given to it being Elephanterion. We have Indicum, also, a substance imported from India, the composition of which is at present unknown to me. Dyers, too, prepare an atramentum from the black inflorescence which adheres to the brazen dye pans. It is made also from the logs of torch pine burnt to charcoal, and pounded in a mortar. The Sepia, too, have a wonderful property of secreting a black fluid, but from this liquid no colour is prepared. The preparation of every kind of atramentum, is completed by exposure to the sun. The black for writing having an admixture of gum, and that for colouring walls an admixture of glue. Black pigment that has been dissolved in vinegar, is not easily effaced by washing."

Dioscorides says, "The ink with which we write, is composed of the smoke collected from lamps. With a pound of gum they mix three ounces of black. By another process branches or pieces of the torch pine are burnt till they become charcoal, when they are extinguished, then pounded in a mortar, and mixed with glue. These make an ink not unpleasant. A third mode is also taken, that of mixing certain proportions of painter's black, pounded charcoal, glue, and what is termed the flowers of brass, (that is the flocculent substance that forms on the surface of melted copper cooled by water)."

Now, although I have sought to show that in many cases the ink of the ancients was composed of a combination of black dye and lamp-black, yet, we know that in some cases it was simply lamp-black mixed with some viscid substance, as gum water or oil. For instance, we find in the MSS. in the Royal Library at Portici, that the letters are blacker than the papyri upon which they are written, though this is perfectly charred; and thus we know that vitriol could not have been employed in the composition of the ink which was used upon them, or the great heat to which they were exposed would have turned the writing to a yellow tint, by evaporating the acid and leaving the iron in a state of oxide or common iron rust. Besides, the delicate nature of the papyrus would not have borne the corrosive nature of a vitriolic ink, which would have penetrated through it, as may frequently be observed in later manuscripts written on parchment, a far less delicate substance than the papyrus. These papyri manuscripts were evidently written with an ink made of oil and lamp-black, which must have been very thick, and was probably used with a brush, and any doubts as to its composition were set at rest by the discovery, at Herculaneum, of an inkstand with a small quantity of ink in it, which, upon examination, proved to be merely a thick rich oil mixed with lamp-black. The lamp-black was ground up with the oil as painters' colours are now done, and by remembering this we can understand the meaning of Demosthenes when, in a speech of his, he taunts his great rival, Æschines, for having been compelled in his youth, through poverty, to sweep the school, sponge the benches, and grind the ink. This description of ink was also, in some cases, in use in the 7th century, which we learn from a description given by Isidorus, of Seville, as to the nature of its manufacture. But the difference of views regarding the composition of these ancient inks has plainly arisen from the idea that all must have been made by some uniform receipt, which was no more probable than that it should be the case in the present day.

From the fact that there appears less change of colour in the documents written prior to the 10th century, I conclude that while in many cases the very early inks were purely carbonaceous, great care being taken in the use of them, yet, that as the art

of dyeing became better understood, so the mixture of black dyes with carbon gradually came into use, till at last the trouble attending that made with carbon led gradually to its being less and less adopted, and it was at length entirely discarded, and the ink made simply with the sulphate of iron and gum combined with an astringent, such as galls or logwood. A substitute for ink was obtained by the Africans from the dark fluid which the Sepia or cuttle-fish has the property of ejecting to conceal its retreat when pursued by an enemy. From Persius, when describing the apparatus of the indolent student, using the word sepia for writing, it is probable that though not generally in use amongst the Romans, it was occasionally employed.

Besides black, the ancients used many different colours. Thus, we find the Sacrum Encaustum, a purple ink, the composition of which was kept a profound secret, was employed for signing documents by the Roman emperors, to whose use it was exclusively reserved; and, by an edict of Leo the Great, it was forbidden, under pain of death, to possess, use or even endeavour to obtain it from the vigilant officers in whose custody it was preserved. This edict was in force from A.D. 470 to 1452, except that in the 12th century the privilege of using it was extended to the members of the Imperial Family, and, in some cases, to the great officers of state. Green ink was especially reserved for the signatures of the guardians of the Greek emperors while their wards were minors.

Since the inferiority of modern ink, compared with the ancient, has become known, several parties have directed their attention to its improvement, but I regret to say with as yet very little result. Those only whose researches on this point are really worthy of much attention are Dr. Lewis, published in his work already referred to, and those of Rebaucourt, published in the 12th vol. of the French Annals of Chemistry; but, unfortunately, they arrive at very different conclusions.

Dr. Lewis considers the rapid decay of many modern inks to arise from a deficiency in the quantity of galls, for, these being perishable, he conceives that the amount which gives the deepest colour at first may be insufficient to maintain it afterwards, and says the great art of making inks is to have a superabundance of astringent matter, so as to counteract the tendency of the iron to oxidation, which is the cause of the ink turning brown and afterwards to a yellow hue, and he recommends that the galls be finely powdered.

Rebaucourt, on the other hand, tells us that none of the principles should be in excess. "For," he says, "if there be more galls than the iron requires, the remainder will be nearly in the state of a decoction of galls, subject to change by becoming mouldy, and undergoing an alteration in the writing which will destroy its legibility much more completely than the change undergone by ink containing too small a proportion of galls; while, on the other hand, if there be a deficiency of them, part only of the salt of iron is decomposed, and the remaining portion will, by exposure, become oxidised and change its colour." He recommends bruising the galls, and not pounding them, and proposes, in addition to the iron, to use the sulphate of copper; but this, though Pliny and Dioscorides tell us copper was used in former times, has great practical objections in modern days, because, in using steel pens, the metal immediately becomes coated with copper, and the acid, set free, soon corrodes them, and they become brittle and useless, while with quills, the knife used in making them is in like manner covered with copper, and the acid, acting on the steel edge, causes it to require constant sharpening.

But I am convinced there is more to be considered in connection with the permanence of our written documents than merely the composition of the ink which is used upon them, and that there is much truth in the opinion of Sir Charles Blagden, that the permanence of ancient writings greatly arose from the quality

I made, as you may suppose, an immense number of experiments without success, but at last the idea occurred to me, that by preparing the ink I wrote with, and the paper, with different chemicals having a strong affinity for each other, and which should throw down coloured precipitates, or by chemical reaction change colour wherever they came in contact, I might instead of one take many copies of a document at the same time, and after I had tried many chemicals I found my theory to be correct. The process which gave me most copies was by preparing the thin paper with the neutral chromate of potash, and writing with a strong solution of extract of logwood. Many experiments were required to discover the right strength of the solution of neutral chromate of potash with which the paper is to be prepared, because if I used much of it I could only take one or two copies, as the whole of the extract of logwood would be acted upon by the quantity of the chemical salt in the first sheet or two, therefore to get many copies it is necessary so to reduce the quantity, that while there is enough to have a chemical affinity for the extract, and to change colour wherever it is attracted, it shall not be enough to neutralise the extract until the desired number of copies are taken, and therefore, instead of having paper prepared with the different quantities of the salt, according to the number of copies required, which would have tended to much confusion in all offices of business, we thought it best to have one standard for the paper, and though we would only keep one ink for letter writing and general purposes, yet we make different quantities of this manifold copying fluid. We have three of these, our No. 1 is the ink formerly noticed as useful for both copying and book purposes, and from which two copies may be taken; our No. 2 has no galls or iron, but is a solution of pure extract of logwood so carefully prepared that exposure to the air in its liquid state shall not have any effect on it, although otherwise it would change in a few months, and from which six or eight copies may be taken at the same time. Another we call No. 3, which is the same, only containing more extract of logwood, and which gives twenty to thirty copies, even more if the writing is allowed thoroughly to dry before attempting to copy.

We have also produced an Indian ink on the same principle, which, when used in the preparation of architectural plans, maps, &c., will give one or more clear copies of even the finest lines, and I had hoped to have had specimens of this class of work for your inspection, but the short time I have had for preparation must be my apology for the omission. The only point to be observed in the taking of such copies, is that as they are done to a scale, they must be kept pressed in close contact with the original, till they are perfectly dry, because if not they will shrink in drying, and the scale be spoilt. While speaking of copying such plans, I may state what, I believe, has never before appeared in print, or been made public, that the ingenious Watt, who invented the plan of copying letters, turned his attention to this point also, and, instead of the ordinary China or Indian ink, used lamp-black rubbed up with the finest and oldest sherry wine, and from plans so made took off a copy on damp paper. From this, which, of course, was reversed, he could take many copies, by letting a boy overrun each of the lines with a mixture of lamp-black and sherry, and after each time of its being so overrun he could take 4 or 6 copies on damp paper. But though the process is adopted by one or two engineering houses in the present day, it is very troublesome, and unless very many copies are needed, it has always been found easier to take tracings. But in all architect's and engineer's offices we believe that our process will be adopted and save an immense deal of time and labour.

Relative to printing ink, your time requires that my remarks be comparatively brief. In examining the earliest printed works, one particularly notices, that while the ink used in the first stages of block-printing was

of a very inferior sort, yet that which was used in the first works printed from moveable types, was far superior to that in use towards the end of the last and beginning of the present century. The former still retain a depth, brilliancy, and richness of colour, both in the letter-press and illuminated capitals, apparently as perfect as the day they were printed, while in the latter the ink is brown, withered-looking, and destitute of all clear, distinct, and brilliant appearance.

Within the last few years, however, great improvement has been made in this branch of art, and the best inks of the present day, equal, if not excel those of Caxton and the early printers. For these improvements we are greatly indebted to the chemical knowledge brought to bear upon this branch of manufacture by the Messrs. Flemmings, of Leith, and as they carried off the prize medals for printing inks at both the New York and Paris Exhibitions, I have consulted them, and would here acknowledge their kindness in fully explaining to me the most important points in the manufacture of really good printing ink.

We will first consider the necessary qualifications for it, and then see how best to attain these.

1st. It must distribute freely and easily, and work sharp and clean.

2nd. It must not have too great tenacity for the type, but have a much greater affinity for the paper, and so come off freely upon it.

3rdly. It must dry almost immediately on the paper but not dry at all on the type or rollers; this is a great desideratum especially for newspapers; this drying should be so rapid, that the sheets on being delivered from the machine, will allow the thumb nail to be drawn swiftly over the surface of the newly printed matter without smearing; and though this constant drying on the paper and never drying on the roller or type seems a contradiction and absurdity, yet it is one of the easiest points to be obtained if the manufacturer has any chemical knowledge, and if he is destitute of this it will be in vain for him to attempt to perfect the ink in this respect.

4th. It should be literally proof against the effects of time and chemical re-agents, and never change its colour.

To attain these objects, great experience and care are required in the purchase of the raw materials. Of one of these, linseed, there are many varieties, the Baltic, Black Sea, and East Indian, each yielding oil very materially different, the one kind giving by pressure a thin limpid oil, another a thick mucilaginous oil, which produce very different results under the same application of temperature. The ink-maker having, then, tried his seed previous to purchase, to see that it yields the best oil, must be careful in its mode of crushing, and should only use the oil which comes from the first crushing, because the increase of pressure, after the first oil has been expressed, or the method of steaming the seed and crushing again, gives an additional quantity of fatty matter, which spoils the ink, and which, when present in large quantities, cannot be effectually extracted.

The oil is now clarified from the fatty matters, which will come away, even with the first pressing, and the pure oil is then boiled with great care, regulating the temperature with thermometers, and when in a proper state, the best pale yellow soap is added, to give it consistency. During the boiling, the dryers are added with great care, the proportion varying with the strength of the varnish required. The soap should be previously tested, and the ingredients known. The boiled oil, with these additions, becomes a varnish. In the making of ink for some of the finer descriptions of book-work, palm oil and cocoa-nut oil are valuable additions.

The next point is the manufacture of the blacks, which is a far more scientific operation than one would at first imagine. The finest naphtha only, very carefully rectified, should be used, and on burning it the application of oxygen must be regulated to the combustion, otherwise the sudden expansion of the gases with li

vent would cause a serious explosion, and the same is true of the blacks, not only for the safety but for the quality of the blacks, as, if you have not the right quantity of iron, the blacks will have more or less of a brown tinge, and be very inferior in quality. The employment of iron is now being burnt off, but the secret of making good blacks, which only practice and chemical knowledge will give, is to have as little of this oil present as possible, so that the more experienced manufacturers have tried to get rid of than others. The black, if of a sufficiently deep and rich colour, is now to be ground up, and mixed with the varnish, which completes the manufacture of the ink, and thus made, it can never turn of a brown colour. But most black requires to be mixed with time to give it depth of colour, and the blue being fugitive, will, after a time, fade and leave the printing of a brown tinge.

Relative to this blue, I would advise the manufacturer to see that his prussiate of potash, nitro-muriate of iron, and acids, are chemically pure, and to use leaden or enamel boilers, instead of the iron ones which they too generally employ. These should be heated by steam passing through leaden or enamelled tubes, as the brightness of the colour depends entirely on chemical purity. Ink made upon this plan, while doubtless the best for book purposes, does not answer for many of the requirements of commerce, and some of the railway companies and large mercantile firms have long been anxious to obtain an ink capable of having copies taken from it by the ordinary copying press. This difficulty we have, at least, got over, by using a deep-coloured varnish, which will freely dissolve in water, instead of the oily one just described, with which we grind our black, or, if we desire more than one duplicate, using a chemical in it such as logwood, and taking our copies on the prepared copying paper, regulating the proportions of logwood to the number of copies required. These copies, with the original, being based on the same principles as our plan of taking duplicates of written documents, are, like them, proof against chemical re-agents, or the probable effects of time.

I had proposed to have explained how, by varying the chemicals used, the same principles may be carried out to take manifold coloured copies of drawings, paintings, &c., but time forbids. I trust, however, I have succeeded in stirring up inquiry on this subject, and in showing you that it is possible to have our writings as lasting as those of ancient days, and that our plan of taking multiplied copies of written and printed documents is very simple, and of no small literary and commercial value.

DISCUSSION.

The CHAIRMAN said that it now became his duty to invite discussion on the subject opened up by the paper of Mr. Underwood, which was one of great commercial and economic importance, as well to the professional and literary world as to merchants, bankers, and traders. The statement which they had heard, and in which was traced the history of the art of writing and of the materials employed, from the earliest times, through the middle ages, when the chief scribes were monks and friars, down to our own times, was replete with interest, and did credit to the research of the author of the paper. The Society was favoured that evening with the attendance of many gentlemen who, from their scientific and professional knowledge were eminently competent to discuss the subject. His friend Mr. Deputy Lott, for instance, was not only a solicitor, and therefore interested in the success of Mr. Underwood's invention, but, being an active member of the Antiquarian Society, he was always alive to the progress of antiquarian research, and the citizens of London were largely indebted to him for the preservation of many important specimens of ancient architecture. He begged therefore to invite Mr. Lott and other gentlemen to join in the discussion.

Mr. Deputy LOTT said the importance of this subject was certainly be overrated. He felt an interest in it, because six or seven years ago, when he had the honour of a seat in the Council of the Society, he induced his colleagues to offer a premium for a process of copying manuscripts superior to any that was then in use. As a matter of fact it to be a matter of immense importance, and understanding what had been stated by the author of the paper, he was still of opinion that, up to the present time, the inventions that had been brought out were far from producing results so satisfactory as he desired. As far as he was aware, there were only two processes which had been practically carried out in the copying processes hitherto used; one of them had been used by Mr. Underwood, and he (Mr. Lott), could not but hope that the process described was an improvement on what had hitherto been done. Still, however, it was too often found in practice—whether from the defect of the ink or the paper he could not say—that the copy was minus half the original, or that in the lapse of three or four years the document was not in a state to be produced in a court of justice as an authentic copy. It was of the greatest importance in his own profession that documents should be capable of verification beyond all dispute, but as far as he was acquainted with what had been accomplished up to this time, he was sorry to say, the objections he had stated had not been removed. The other mode of copying was that known as the manifold writer, and this he thought by no means satisfactory, and the writing with the style was much objected to. With reference to the mode of copying introduced by Mr. Underwood the results certainly appeared, judging from the specimens exhibited, fairly successful. Still he (Mr. Lott) thought much remained to be done in that direction. The specimen which he had examined was somewhat imperfect, and appeared to be fading; but the scientific investigations which had been made into the question would probably ultimately lead to these defects being obviated. The author of the paper had dwelt upon the superiority of the inks used in former times. In illustration of that he would mention that he had seen in Durham Cathedral a copy of the Scriptures transcribed by the Venerable Bede, in which the ink used must have been of the very best description, inasmuch as at this distant period the writing was perfect, and the ink a beautiful black. Some years ago he laid upon the table of the Antiquarian Society a grant from the crown, signed by Queen Katherine as regent of the kingdom, during the temporary absence of Henry VIII. at the Field of the Cloth of Gold. It was the most beautiful specimen of writing he had ever seen, and the ink was a perfect black. There was another method of copying to which he would advert in which the sun was the agent—he alluded to photography; having seen wonderful reproductions of the title pages of books as well as MSS., he thought that its application might be extended to more useful and practical purposes. If this agent could be brought into general use it would prove a very great desideratum to the members of his own profession, as he believed, by that means, a perfect copy of a MS. could be secured.

Mr. CHARLES MAY said, this was a subject which had occupied much of his attention for many years. In the early transaction of the Society, there was to be seen a copy of the specification of James Watt, for an ink for copying purposes, and the mode of preparation was described. The paper upon which the copy was taken was prepared with a weak solution of galls. He had seen copies of MSS. in the possession of the present firm of James Watt and Co., which had been in existence for upwards of 70 years, and which, although they had lost their pristine blackness, were nevertheless perfectly legible, owing to the quantity of oxide of iron deposited upon the paper by the ink employed. He (Mr. May) was inclined to believe that no preparation of vegetable acids, in combina-

tion with iron, would for any great length of time retain its blackness, so long as paper bleached with chlorine was used. It was to this circumstance that he chiefly attributed the marked difference which was observable between the state of preservation of the colour of ink in ancient and modern MSS., rather than to any special difference in the ingredients of the ink itself. With reference to the periods of time at which written documents could be copied, he would mention that for some years he used in his business transactions Arnold's ink, and he could obtain a distinct copy from that three weeks after it was written. It was not a pleasant coloured ink in the first using, being very dull, but it afterwards became a good black. With a little management three or four copies could be taken. He was rather surprised that Mr. Underwood had not referred to the use of indigo in inks. Indigo was capable of preparation for such purposes, and the blue inks of the present day, he believed, consisted of indigo, partly deoxygenised, so as to become soluble with an admixture of a small proportion of gallic acid and iron. This had the effect of producing a black colour after some time, and from that description of ink he thought several copies could be taken. With reference to the use of logwood, he very much doubted whether any preparation of this substance would be permanent. It was a most beautiful dye, being the chief ingredient in the dyeing of beaver hats, but it was invariably found that exposure to sea air turned them brown, and he had great doubts as to the propriety of using vegetable matter as the basis of an ink in which permanence of colour was a consideration, especially when employed on paper bleached with chlorine, which he believed could not be effectually got rid of by any amount of washing. The subject was one of great importance, and he agreed with Mr. Lott as to the great desirability of securing copies of documents which could be authenticated in courts of justice. He believed that much of the fading of documents copied by the ordinary process was caused by want of attention on the part of the clerks entrusted with the work. The copies were not taken so well as might be done even with the present appliances. The great object to be attained in all copying processes was an uniform dampness, without a surcharge of water in the paper. He would mention that inks which through age had become of a yellow tint, might be restored to blackness by the use of gallic acid; but this fact was frequently observable,—that the iron held in solution in the ink penetrated the fibres of the paper, and distributed itself beyond the line described by the pen; therefore, if the copy was taken upon paper too much damped (and perhaps the book being shut up damp), the iron constituent of the ink travelled out of its line, and when such writing was restored by the use of gallic acid, much confusion was the result.

Mr. CORNELIUS WALFORD remarked upon the carelessness with which copies of letters, &c., were at present taken. He believed, with ordinary precautions, the present process would be found to be all that was required.

Mr. STEPHENS, as a manufacturer of inks, and having extensively experimented on this subject, would refer to the use of chromate of potash in the preparation of paper, as referred to by Mr. Underwood. Some years ago, he (Mr. Stephens) introduced a marking ink, the preparation for which upon linen consisted of neutral chromate of potash. It had been found necessary that the chromate should be removed by washing after the linen was marked, and in such cases the results had been satisfactory; but, having exported a quantity of his marking ink to America, he had received a demand for compensation for linen destroyed through the use of his marking ink. The fact was, that, in the instance referred to, the chromate had not been washed out after marking. The result was the destruction of that portion of the linen to which the chromate had been applied. Mr. Stephens proceeded to state his experience in the use of indigo as a constituent of writing ink, the indigo being chemically

prepared so as to render it more soluble, and the results of experiments, both as to moisture and exposure to sea air, had proved the durability of that description of ink. Ink with a vegetable basis had a tendency to decay, which was apparent even when it was kept in bottles. He thought ink made with prussiate of iron was more permanent. When first used, the writing was of a pale colour, which, upon withdrawal from the light, became more intense. Mr. Stephens mentioned the results of several experiments with this material, and observed that although prejudice against coloured inks had gone to such an extent that an American judge refused to recognize documents written in blue ink, yet he hoped such an objection would not be allowed to operate against that which had been found to be of practical utility.

Mr. PEARSALE, without wishing in the least degree to detract from the merits of any invention, would state that, in his own experience, he had found that blue ink was obliterated from the accidental spilling of water over a sheet written upon with it. If that had been the experience of American judges, he could account for their objection to that description of ink.

Mr. STEPHENS remarked that this would not be the case with documents which had been written for any length of time.

Mr. RUDOLPH APPEL, the inventor of the anastatic and Appolotype processes, stated, that having for twenty-eight years been engaged in transferring printed and written documents of all kinds, and in multiplying copies of them, he might fairly be presumed to know something of the subject then under discussion. About thirteen years since he exhibited to the members of the Society of Arts his anastatic process, when the chairman and various members of the Society wrote their signatures and some sentences, which were transferred, and very many copies worked therefrom within ten minutes, or thereabouts, in each case; and he further stated, that the anastatic process, unlike Mr. Underwood's, was capable of producing any number of perfect copies with a very small amount of labour, occupying only a few minutes in transferring, when the original had been recently written. He was able to reproduce drawings, maps, engineering and architectural plans, with the same facility as common writing, and he had succeeded in reproducing the finest impressions from engraved copperplates, which had been printed from 50 to 70 years. Mr. Appel instanced the reproduction of the great Austrian maps of Russia and Turkey, occupying an area of about 60 square feet; these he was employed by the English government to reproduce and print at the beginning of the Russian war, and he then delivered fifty perfect copies of each of these great maps within a fortnight. The anastatic process was daily employed at Aldershot and other similar establishments, for the circulation of general orders and official instructions, as well as in the Privy Council Office and other government departments. He thought Mr. Underwood's process was only applicable for producing a small number of copies; certainly, if the vegetable ink made according to Mr. Underwood's method, was found in practice to be permanent, there was no doubt it would be a great improvement, but from his (Mr. Appel's) experience in the manufacture of inks, he was unable to agree with the author of the paper in the conclusions to which he had arrived; still he thought there were many purposes to which Mr. Underwood's process might be applicable.

Mr. VAUGHAN PRINCE begged to ask what had been the results of the application of Mr. Underwood's plan to the purposes of railway companies, such as the copying of way-bills, &c.

Mr. LAWRENCE wished to ask the lecturer whether he used the ordinary press for copying by his process, and whether the copying ink would serve for ordinary writing, as the copying ink in ordinary use was not adapted for general purposes.

Mr. UNDERWOOD replied in the affirmative.

The Chairman remarked that as the author of the paper had very properly said that the material on which the note was a very important element of durability, he might mention from his own experience, as one of the Court of the Weavers' Company, the oldest of all the City Companies, the corporation of London not excepted, that they possessed a charter granted to them in the 12th century by Henry II. (in which reference was made to one previously granted by his great grandfather William the Conqueror, the writing of which was apparently perfect in all respects as when first produced. He might also incidentally mention that it possessed a merit which professional gentlemen, and especially law-reformers and law makers, would appreciate, viz., distinctness and brevity. The provisions of the charter had never been disputed, and yet the document itself was compressed within dimensions not exceeding those of the palm of his hand, would that the same could be said of modern charters.

Mr. Verner could confirm the statement made as to the effect of the action of chlorine used for bleaching paper. He had some instances in which the writing was nearly obliterated by the action of chlorine. The best way of preserving documents that he was aware of was by the process of the neutral chromate of potash.

The Chairman then proposed a vote of thanks to Mr. Watson for his paper, which was unanimously passed. Mr. Watson, in returning thanks, said he could not but be gratified to hear as to the permanence of the neutral chromate of potash ink, that the neutral chromate of potash was not fugitive, as was that made by the use of iron and tannin, as was that made by the use of iron and tannin. He had represented had a copy of the paper taken nine months ago, which, when he had it, was of a more intense black than the original. He had tried soaking them in water, in dilute sulphuric acid, and dilute sulphuric acid, and being able to efface the writing. He had also tried the neutral chromate of potash destroying the ink, and in some of time, he believed that if it was used in the indelible form necessary for marking documents, it would have that effect, but the very weak solution would not be necessary to employ if he desired many copies of a document, and which was also used in the preparation of the indelible ink. He had rather a contrary effect, and the largest quantity of the stationary trade agreed with him in believing that the paper was much improved in durability by the process of preparation, and the copies he had taken through done on much thinner copying paper than usual, showed no tendency to decay, and would be handled better than many on stouter paper which was prepared. He had not been able to give the answer to the peculiarly important part of this question, the great facility with which any person could take twenty or thirty copies of a written document in a short time for the purposes of rapidly transmitting information. It was most valuable, as any policeman would be glad to be in the station when the information could be sent off in 17 or 20 copies in ten minutes. The Chairman then asked whether Railway and Steam Navigation Companies acknowledged it would be of great advantage to them for it not only enabled them to copy telegrams, sailing, and writing of their large way-bills, etc., but the "memorandum notes," frequently sent from station to station, might not only be copied, but even a third copy might be taken when the original was sent back to the station from which it was originally sent. Mr. Watson said that, however great, between the two or three copies making no difference. Bankers and merchants, also, were adopting it with great success, for he had seen many copies of advice letters, foreign letters, and so on, and this might be done by any ordinary office boy, a great pecuniary saving was effected.

The paper was illustrated by specimens exhibited by Messrs. Underwood and Burt, the patentees of the process, showing copies of large printed and ruled Railway Invoices, Steam Navigation Companies' Manifest Sheets, Forms of Letters, and other documents; besides some 40 or 50 clean copies taken from their different writing inks, as well as specimens of writing on prepared paper, in which the characters had been attempted to be obliterated by oxalic acid, dilute sulphuric acid, and chloride of lime, none of them having been rendered illegible.

The Secretary announced that the next meeting would be held on Wednesday, the 13th January, 1858, when a paper by Mr. J. Bailey Denton, "On the Advantage of a Daily Register of the Rain-fall throughout the United Kingdom, and the best means of obtaining it," would be read.

THE FOOD GRAINS OF INDIA.

By Dr. J. H. GILBERT.

As the Chairman directed the discussion on the recent admirable paper of Dr. Watson, in the first instance, to the questions more particularly affecting India herself, and there seemed to be no opportunity for discussing the subject in its chemical and dietetic aspects after he had himself spoken upon them, perhaps it may be well to make one or two observations in this form.

But, first, a word or two on the question of the import of Indian grains and pulses into this country. It seemed to be generally admitted that the ravages of the weevil in Indian wheat proved a very great obstacle to its extensive import, though, from the examination, in the Rothamsted laboratory, of some Indian wheat sent to this country, as well as from the information obtained by Dr. Watson on that head, it would appear probable that, if uninjured, these wheats would be extremely valuable in admixture, when, as too frequently is the case, large quantities of our own home-produced grains are badly matured, or got in bad condition. Wheats which serve this purpose, are, however, generally open to the objection mentioned—that of being very difficult to grind with our stones; otherwise, from their composition, we should expect them to fetch much better relative prices than they generally do. Dr. Watson properly observed that the samples of Indian wheat examined contained less water than the average of our home-grown grain. But this is the case with most imported wheats: for they are generally ripened in hotter summers than our own; nor could they be transported, were they not, either naturally or by special management, rendered drier than the average of our own.

Several of the speakers seemed to think that some of the Indian pulses might, with advantage, be cultivated in this country; and the trial would certainly be very desirable. As to their importation, it was suggested by one speaker that our farmers might possibly look upon their introduction with some jealousy. Whatever might be the feeling as to the importation of greatly increased amounts of wheat, I think there would be anything but a tendency to jealous feeling, at a considerable importation of these highly nitrogenous pulses. On the contrary, in these times, when high farming is daily gaining ground, and the supplies of artificial nitrogenous manures are so much below the demand, it would be a great boon to the farmer to have a cheap source of these highly nitrogenous seeds, by which he would directly increase his production of meat and manure, and indirectly that of grain also.

But it is in relation to the bearings of Dr. Watson's

paper upon the "Chemistry of Food," and the practical application of dietetic principles, that I would chiefly call attention. No one can doubt that we owe an immensity to Baron Liebig for his admirable generalisations on the subjects of the chemistry of food, some dozen or fifteen years ago. Nor can it, on the other hand, be disputed, that, besides clearly defining the special offices of the nitrogenous and non-nitrogenous constituents of food respectively, he, in making allusion to the practical application of his principles, throughout assumed that the relative values of current food-stuffs would be measurable, more by the amount of their nitrogenous constituents than by the character and amount of their non-nitrogenous ones. Thus, even as late as 1851, he says:—

"The admirable experiments of Boussingault prove that the increase in the weight of the body in the fattening or feeding of stock (just as is the case with the supply of milk obtained from milch cows), is in proportion to the amount of plastic constituents in the daily supply of fodder." And, again, "It is found that animals require for their support less of any vegetable food in proportion as it is richer in these peculiar matters, and cannot be nourished by vegetables in which these matters are absent."

So far, indeed, throughout his writings on the subject, has it been the pervading idea that in our food the nitrogenous constituents were most likely to be found defective, that almost every subsequent writer and investigator has assumed this to be his view; nor, indeed, at the time he first wrote, was there experimental evidence at command to decide the question one way or the other. Our highest authorities, both in this country and abroad, especially those connected with agricultural chemistry, have for the most part, at any rate until recently, adopted the same view; and most of the tables of the composition of different articles of food have been assumed to indicate relative value according to relative amount of nitrogenous compounds. Sometimes, indeed, the writer has had an obvious misgiving, seeing that theory and experience were not in accord; but this has been accounted for generally to the disparagement of adopted practices. Those, however, who have been aided by careful observation, and especially those who, looking at the subject from a physiological and medical point of view, have weighed their experience with the light thus thrown upon it, have seen reason to call in question the validity of the prevailing opinions. It is, indeed, a particular satisfaction to see so marked a qualification of the notions referred to, in the papers by Drs. Letheby and Watson respectively, which have been read before the Society of Arts during the present year.

The experience of Mr. Lawes and myself, during a dozen years of laborious experimenting on the feeding of animals, has been to show that, as our staple food-stuffs go, both the amount of food consumed, and the amount of increase produced, have a much closer relation to the amount of non-nitrogenous constituents than to that of the nitrogenous ones.

The analysis of numerous half-carasses of butchers' meat has shown us, that several such contained a larger proportion of respiratory or fat-yielding material in relation to nitrogenous or plastic compounds, than even bread. The results of this investigation will, however, shortly be published in full.

From the fact last mentioned, it will not be surprising that the average of the 86 dietaries calculated by us, as quoted by Dr. Watson (many of which contained liberal proportions of animal food), should have shown a proportion of gross non-nitrogenous constituents to nitrogenous ones, almost as high as in bread. And it may be mentioned that, provided about one-eighth of the total non-nitrogenous substance be supposed to be fatty matter, then the relation of the respiratory or fat-yielding to plastic or flesh-forming constituents, would be fully as high in the average of these 86 dietaries as in bread. The difference in the respiratory capacities of fat and the

starch series of compounds was more than once called attention to by Dr. Watson, as affecting the relative value of the assimilable non-nitrogenous constituents of food.

That the existence of a certain amount of *fatty matter*, in some form or other, and particularly when duly blended with other matters, as in meat, constitutes the characteristic of a high class of dietary, much more than does a high relation of plastic to respiratory matter, there can be little doubt.

If instinct, and market price as influenced by it, are to be accounted as of any value in showing what are the natural calls of the system, and that our current articles of food are not valuable according to the amounts of the nitrogenous or plastic constituents they yield, the following facts will illustrate it sufficiently strikingly. At the present time we can purchase one pound of nitrogenous or plastic matter—

	s.	d.
In wheaten flour or bread for about	1	6
In beans and peas	0	4
In butchers' meat	5	0

It is, then, something else than their relative amounts of nitrogenous compounds which determines the relative values of our current foods in meeting the wants of the system. It is obvious that we could, at a very small cost, increase the per-centage of nitrogen in our bread, if that were all that were needed to make it a first-class food. But, supposing neither the plastic nor respiratory class of constituents deficient in actual amount, it is not, even then, immaterial in what form they are presented to the system. Drs. Letheby and Watson have insisted upon the necessity of keeping in view, not only ultimate chemical composition, but the condition and variety in which the constituents are presented. Nor is their any doubt that in the replacement of a certain amount of starch (and its congeners) by fat, there is generally something more, as regards the health and vigour of the body, than the mere substitution of chemical equivalents of respiratory and fat-yielding material.

In conclusion, referring to the Chairman's illustration, it may be remarked, that no one, so far as I am aware, has ever attributed to Baron Liebig the folly of recommending the repair of the material structure of an engine, when it was proved that fuel and steam were all that it required to keep it in vigorous working. There is, however, no doubt, that after showing with what materials the machine itself must be kept in order—what must be used as fuel—and that that which would serve only for the latter purpose could obviously not serve for the former—Baron Liebig, by the whole tenor of his argument on the application to practice of these principles, tacitly assumed that the repair of the machine would require a more assiduous attention than the supply of fuel.

Home Correspondence.

THE SMOKE QUESTION.

SIR,—In the recent discussion on Mr. Pellatt's paper, Mr. Greaves, after giving us the results of his most valuable large-scale experiments, arrived at the somewhat melancholy conclusion that the avoidance of giving off smoke costs 7s. a ton on the fuel used. In November, 1853, you published in the *Journal* a letter giving the results of our experience of mechanical self-feeding smoke-burning grates. A longer experience, with an increased number of furnaces, confirms the results thus given. We have never made a hobby of any particular smoke-burning contrivance, but the large quantities of steam required in our works has made the cheapness and efficiency of fuel an important c

The CHAIR
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Mr. VARLEY, the destructive paper. He had nearly obliterated preserving documents perfect exclusio

The CHAIRMAN
Underwood for 1935

Mr. USURY. assure those who the copies (also chromate paper with iron; and in their possession instead of his) than when from solutions of a phosphoric acid. Relative to the probability of the paper in the linen it mentioned he has copies of a same diluted writing paper houses in the thing that time by the presence by him, the than usual, bear rough which was the time the invention, a might take in a short time police intelligence who happened arrived, could ready for the Navigation service to the printing bills, invoices frequently sent copied provided with a be copied, and this came but sent, the interest taking of the and merchants for the taking invoices, &c., office boy, a

Work done=1787 tons=4,002,889lb raised 1,500 feet=
6,004,380,000lb raised 1 foot=185,180lb=raised 1 foot
by 1lb of coal, at a cost of .1017d.

COKE :

Time of working, 90 hours; number of strokes, by
counter, 184,484; coke used, 12 tons. 14 cwt.=28,448lb,
at 16s. 8d. per ton=£10 11s. 8d.=2,540d.=.0892d.
per lb.

Work done=1,379.77 tons=3,090,684lb raised 1,500 feet
=4,636,026,000lb raised 1 foot=163,000lb raised 1 foot
by 1lb of coke, at a cost of .0892d.

Hence, the proportions between the weight raised and
uel used, are—for Coal, 185,180 to 1

Coke, 163,000 to 1.

and 163,000 is to 185,180 as 100 is to 113, so that, irre-
spective of cost, it appears that coal is 13 per cent. more
efficient than coke, or one ton of coal would be equal to
1.13 cwt. of coke. Again, 163,000 is to 185,180 as
.892d. is to .1017d., from which it appears that the
cost of doing a given amount of work by coal or coke,
weight for weight, would be as nearly as possible equal,
the difference being only .0004d.

Hence we may conclude that with coal at 19s.,
and coke at 16s. 8d. per ton, whether with regard to
economy or efficiency, the results of using either will be
early as possible equal, the superior efficiency of the
one being compensated by the lower prices of the coke.

There is, however, a fallacy in thus reasoning, inas-
much as coal, by its conversion into coke, loses about 40
per cent. of its weight; it is therefore quite clear that
the cost, added to the cost of manufacture, must necessarily
be more expensive than coal, unless, as in the
instances under consideration, its manufacture has not
a special and primary object.

It is probably owing to this that there exists so much
dissension of opinion on the subject, which led one of
the speakers to represent his experiments as leading to
the conclusion that—in the performances of a given
amount of work—the cost when done by coals was 16s.,
and coke 37s. 6d., the latter being, no doubt, locomo-
tive.—I am, &c., JOHN LEONARD.

Senior-road, St. John's-wood, Dec. 7, 1857.

THE BURNING OF COKE AND THE SMOKE NUISANCE.

In reference to the recent discussion at our So-
ciety the "Substitution of Coke for Coal as a remedy
for smoke nuisance," I was sorry to find that the
general view of the case absorbed almost the entire
of the meeting.

It would have been more gratified if the hygienic side
of the question had also been given; and it is in the hope
of the Society that the opinions on this view of the case that I now
submit in a few lines.

Assuming that, in round numbers, there are five million
tons of coal consumed in London, then we have, as the
 $50,000 \times 40 = 2,000,000,000$ cubic feet of coal
 $= 2,000,000,000,000$ cubic feet of carbonic acid
gas; if all this coal be converted into invisible
gas as one part of carbonic acid gas added to
four parts of our atmosphere is sufficient to render
the atmosphere injurious to health, we thus ob-
tain figures, multiplied by one thousand, viz.,
 $2,000,000,000$ cubic feet of our atmosphere con-
sumed by the total combustion of five million tons

of coal. In figures, more within comprehension, we have
estimated 13,560 square miles of air and one
mile, or about 117 miles square and one mile in
depth for the entire year, and if we divide by
the number of hours in a year, we have about six miles square and one mile
London atmosphere daily contaminated, viz.,
about the entire area of London if we
include the suburbs.

As I have long taken a deep interest in the ques-
tion of the abolition of the smoke nuisance, I shall
feel much gratified if any one can prove that the law of
the diffusibility of the gases is sufficient so to neutralise
the above amount of carbonic acid gas as to render our
London atmosphere wholesome under the above circum-
stances.

I am, &c.,

GEO. WYLD, M.D.

6, Great Cumberland-street.

STEAM CULTIVATION.

Sir,—That part of Mr. Sidney's paper, read to the
Society of Arts on the 9th inst., touching upon the ap-
plication of steam to the tillage of the soil, appears to
throw a damper upon its application to light lands,
which, he says, are done at so little cost with horses that
there appears but little chance for steam. Upon this
point he and I differ. I believe it will be found that,
within a very short time, there will be but few good
light-land farmers who will not have and use a steam-
cultivator of his own. Am I not supported in this view
by Mr. Mechi, whom you report to have said that every
farmer with 300 acres ought to have a steam threshing
machine. Then, to have that, they must have got a
steam engine; then, when it is not used in threshing,
grinding, chaff cutting, &c., why should it not be used
in tilling the soil when required, when nothing but a
windlass, &c., and a few implements, comparatively
costless, are required to start it. Here I will give a prac-
tical proof that steam can beat horses in cost on light
land. It so happens that I have no light land on my
farm, but that I had the good fortune to be invited, by
the Royal Bucks Agricultural Society, to work my steam
plough at their meeting, held at Newport Pagnell, in
September last, and that they provided for its working a
light gravelly soil wheat stubble field, on the farm of Mr.
Rogers, of Lathbury, in which five men, with a boy to
fetch water, and an eight-horse engine, ploughed, with
my three coulter plough, five acres and a-half, eight in-
ches deep, in five hours and forty minutes. The actual
cost, including wear and tear, of this kind of work on my
heavy land is 6s. 8d. per acre. All the filth was brought
to the surface without being cut to bits. Mr. Rogers in-
formed me that the clearing it off by hand, with forks,
was comparatively costless, after which he put it in
ridges with a ridging plough and two horses, and it is
now like a perfect garden. Now I challenge any light-
land farmer in England to produce the like result in the
ordinary way at double the cost it has been to bring it to
that beautiful state; I again say, why should not the
engine that Mr. Mechi says every 300 acre farmer
should have, be employed, when not otherwise required,
in producing such results. The case above is not a
solitary one. Lord Hatherton worked a set of my
tackle on his estate at Teddesley, which is moderately
light-working land, the whole of last summer. His lord-
ship stated, at an agricultural meeting held at Stafford,
in September last, that it had effected a saving of forty
per cent. to him.

I am, &c.,

WILLIAM SMITH.

Woolston, Dec. 12, 1857.

Proceedings of Institutions.

BUCKS AND BEARS.—The annual meeting of the Lec-
turers' Association was held at the Town-hall, Windsor,
on Thursday evening, Oct. 12. The chair was occupied by
the Hon. and Very Rev. the Dean of Windsor. The at-
tendance was tolerably numerous, and among those pre-
sent were the Revs. Lord Wriothley Russell, H. J.
Ellison, T. H. Tooke, E. Hale, C. K. Paul, Ellis, C. D.
Goldie, Flint, Haviland, T. Carter, Hodson, S. Mr.
Cotton, J. S. Blunt, Gore, H. Hawtrey, S. Nevill

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vations by Mr. Sanders on the general results of the meeting held at the Eton Reading Room, and by the success attending the labours of the Working Men's Association, the Rev. S. E. A. Douglas, and Mr. Stevens, of Eton College, various suggestions bearing upon the topic of the session. Mr. Tooke, who introduced the subject, briefly summed up, the Dean expressed the satisfaction felt in presiding over the deliberations of the meeting. He also bore testimony to the interest manifested by the brethren in the success of this session. He thought considerable advantages would be derived from College were to grant certificates to pupils in connexion with these institutions similar to those granted by the universities to middle classes. The chairman also alluded to the deep interest taken by his Royal Highness the Prince Consort in the care of the Bucks and Berks Lecturers' Association, and passing a vote of thanks to the Very Rev. the meeting separated.

PARLIAMENTARY REPORTS.

PROFESSIONAL PRINTED PAPERS.

Delivered during the Vacation, 1857.

- 1. Librarians—Return.
- 2. Of Chancery, &c. (Ireland)—Abstract of Return.
- 3. India (Education of the Souths)—Copy of a Letter.
- 4. City Election Petition—Minutes of Evidence.
- 5. Eight (Colonies)—Return.
- 6. Court and Kew Gardens—Return.
- 7. Central and Collegiate Churches—Return.
- 8. Savings Banks—Account.
- 9. Account of Receipt and Expenditure for the year 1856.
- 10. Account of Receipt and Expenditure for the year 1856.
- 11. Sugar—Return.
- 12. (Australia)—Return.
- 13. Officers—Return.
- 14. Orders of Knighthood—Account.
- 15. Grand List (Public Departments)—Return.
- 16. Copies or Extracts of Correspondence.
- 17. St. Edmund's Election Petition—Minutes of Evidence.
- 18. Episcopal Patronage—Return.
- 19. National Education (Ireland)—Return.
- 20. Bath—Return.
- 21. India (Singapore)—Return.
- 22. Court of Chancery (Ireland)—Correspondence.
- 23. County Courts (1st January to 30th September, 1856)—Return.
- 24. County Courts (1st October to 31st December, 1856)—Return.
- 25. Bank Acts—Report and Evidence, Part I.
- 26. Public Monies—Report.
- 27. Progheda Election Petition—Minutes of Evidence.
- 28. County Treasurers (Ireland)—Account.
- 29. Lambeth Election Petition—Minutes of Evidence.
- 30. Mary Union (Workhouse Cemetery)—Correspondence.
- 31. Property Tax and Population—Return.
- 32. Bombay (Titles of Land Commission)—Returns.
- 33. East India (Liberty of the Press)—Copy of a Despatch.
- 34. Dublin City Election Petition—Minutes of Evidence.
- 35. (4). Trade and Navigation—Accounts (31st August).
- 36. (1). Wareham Election—Index to Minutes of Evidence.
- 37. (1). Galway Town Election—Index to Minutes of Evidence.
- 38. Revenue (Ireland)—Accounts.
- 39. Marlborough Election Petition—Minutes of Evidence.
- 40. Metropolitan Drainage—Report.
- 41. Metropolitan Board of Works—Report.
- 42. Poor Law (Ireland)—Returns.
- 43. (1). Beverley Election—Index to Minutes of Evidence.
- 44. Harbours of Refuge—Report from Committee.
- 45. Australian Mail Service—Return.
- 46. Local Board of Health—Return.
- 47. Election Petitions—Alphabetical List.
- 48. Bleaching and Dyeing Works—First Report.
- 49. Friendly Societies—Report of the Registrar.
- 50. Spirits—Accounts.
- 51. Pensions, &c. (Ireland)—Return.
- 52. Rating of Mines—Report and Evidence.
- 53. Coalwhippers Act—Lords Report.
- 54. (5). Trade and Navigation Accounts (30th September).
- 55. (7). Poor Rates and Pauperism—Return.
- 56. Colonial Government—Return.
- 57. Meetings of the House—Return.
- 58. Sale of Poles, &c. Bill—Lords Report.
- 59. Army, Navy, and Ordnance—Detailed Accounts.
- 60. Election—Return.
- 61. Woods, Forests, &c.—35th Report of the Commissioners.
- 62. Contracts (Public Departments)—Report and Evidence.
- 63. Prigths and Measures—Return.
- 64. Bank of England, &c.—Account.

- 71 (A 2). Poor Rates and Pauperism—Return.
- 246 (1). Westminster Bridge—Plans.
- 314. Contested Elections (Poor Law)—Return.
- 353. Hop Duties—Report.
- 324 and 260. Hudson Bay Company—Reports.
- 270. County and District Surveyors, &c. (Ireland)—Report.
- 327. Oxford University—Copy of Ordinances.
- 340. Railways (Amount of Capital, &c.)—Returns.
- 220 (1). Bank Acts Report, Part 2—Appendix and Index.
- 330. Electors (England and Wales)—Abstract of Return.
- 346. Vestry Clerks (Metropolitan Parishes)—Abstract of Return.
- 49 (6). Trade and Navigation Accounts (31st October).
- 346. Public Petitions—Return.
- 211. Bleaching and Dyeing Works—Second Report.
- Honduras—Treaty of Friendship, Commerce, and Navigation.
- China (Naval Forces at Canton)—Further Paper.
- India (Mutinies in the East Indies)—Further Papers.
- Tariffs—Return.
- Trade of various Countries and Places—Abstract of Reports.
- Public General Acts—Cap. 36-38, and Table.

Delivered 4th December, 1857.

1. Bank of England—Correspondence.

Session, 1857.

- 256. Paupers—Return.
- 301. Omnibuses and Cabs (Metropolis)—Return.

Delivered 5th and 7th December, 1857.

1. Bill—Bank Issues Indemnity.
- East India (Mutinies)—Further Papers.

Session, 1857.

- 315. Seamen in Union Workhouses, &c.—Return.
- 337. Electors, &c. (Metropolis)—Return.

Delivered 8th December, 1857.

2. Public Income and Expenditure (Balance Sheet)—Account.
- Spain (International Copyright)—Convention.

Delivered 9th December, 1857.

5. General Committee of Elections—Mr. Speaker's Warrant.
6. Police (Scotland)—Rules and Regulations.
- East Indies (Mutinies)—Further Papers.

Session, 1857.

- 333. Parochial Elections—Abstract of Return.

Delivered 10th December, 1857.

3. Bill—Sir Henry Havelock's Annuity.

Delivered 12th December, 1857.

4. Bill—Oaths.
- Agricultural Statistics (Ireland)—General Abstracts.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Dec. 11, 1857.]

- 2417. John May Munro, jun., of Bristol—An improved metal wheel-stock.
Dated 18th September, 1857.
- 2431. Alphonse René le Mire de Normandy, Judd-street, Brunswick-square—Improvements in the manufacture of soap.
Dated 13th November, 1857.
- 2436. William Devon, 4, Maryland-terrace, Stratford—An improved self-acting apparatus for flushing water-closets, and the means of connecting the same to water mains, part of which are applicable to the junction of gas or water pipes generally.
- 2459. George Sheppard, Fordingbridge, Hants—Improved machinery for cultivating land, or for cutting up and pulverizing the surface thereof.
Dated 16th November, 1857.
- 2472. Casimir Debax-Talabas, Castres, France—Improvements in lithographic printing presses.
- 2474. John Frederick Spencer, Brighton—Certain improvements in steam engines, and the apparatus connected therewith.
- 2476. Thomas Richardson, Newcastle-on-Tyne—An improvement in treating manganese ores.
Dated 17th November, 1857.
- 2478. William Gosage, Widnes, Lancashire—Improvements in the manufacture of certain kinds of soap.
- 2480. Daniel Foxwell, Manchester—The application of certain material for the backs of cards.
- 2482. George Tomlinson Bonsfield, Loughborough-park, Drixton—Improvements in fire-arms, and in detonating compounds to be used therewith. (A communication).
- 2484. Richard Archibald Brooman, 166, Fleet-street—The manufacture upon circular frames of a fabric suitable for petticoats and other garments, and curtains and other articles of furniture, together with apparatus to be employed therein. (A communication).
- 2486. William Eardley Richardes, Bryn-Eithin, Aberystwith, South Wales—An improved war-weapon.
Dated 18th November, 1857.
- 2488. William Howard Bell, Pelton, Durham—Improvements in the permanent way of railways.

[Faint, illegible handwritten notes]

of the Society of Arts.

AY, DECEMBER 25, 1857.

COUNCIL MEETING.

WEDNESDAY, DECEMBER 23, 1857.

wing Institutions have been taken since the last announcement:—

ld, Mechanics' Institution.

rd, Mechanics' and Literary Institute.

ICE TO INSTITUTIONS. CONFERENCE.

cil have fixed to hold a Conference tatives from Institutions in London ighbourhood, with a view to the of Local Boards in connection with ations. The Conference will take day evening, the 11th of January, at when the attendance of two or three ives from each Institution is invited. ives from Institutions not in Union ciety are also invited to be present.

EXAMINATIONS.

ncil have assented to the proposal, e Institutional Association of Lan- Cheshire, that they may be allowed Preliminary Examination for 1858 in and Cheshire, in Easter week, six re Whitsuntide, instead of twelve e, as laid down in the Programme; to be furnished to the Council not re weeks before Whitsuntide.

QUID MANURE QUESTION.

ntion of the Council having been extract from *Bell's Weekly Messenger* the *Journal* of the 26th of September, to express their regret that it should advertently inserted, as containing ob- flecting personally upon individuals.

VANILLA.

time since the Society received, through den, the Secretary of the Agricultural and Society of India, some pods of the *Vanilla l Y. planifolia*, grown in the garden belong- ciety. Mr. Blechynden writes, in reference, as follows:—

ants have been some years introduced into is only recently that we have been able to rom them by resorting to artificial means. propagated most readily, and will no doubt alised here." The pods have been placed of Messrs. Cartell and Brown, of Prince- ster-square, for trial, who report as follows: used the vanilla sent, and find the strength pods were very small, and were much dried ce of being packed in wadding, instead of

being wrapped in tinfoil and packed in a tin case. We consider it of good quality. To make it of commercial value the pods should be long and of a very dark colour, almost approaching to black. They should also be moist, and if properly ripened before being packed, they become, after a time, covered with minute acicular crystals, which much add to their appearance and marketable value. The value of the pods sent was about 50s. per lb. Had it been fine (say $1\frac{1}{4}$ inches longer), and in the condition above mentioned, it would realise from 80s. to 90s. per lb. The present price of vanilla is about 20s. per lb. above the average value."

ON THE COMPARATIVE CAPABILITIES OF STEAM-SHIPS AS DEPENDING ON THEIR MAGNITUDE.

By CHARLES ATHERTON, CHIEF ENGINEER, ROYAL DOCKYARD, WOOLWICH.

Experience of the past four years, especially in connection with the steam transport service of the Crimean war, events now in progress as respects our steam communication with China and India for military purposes, the present aspect of the probable future, opening up as it does a totally new era and order of things as respects mercantile intercommunication between England and the far distant regions of India, Australia, China, California, and Japan, involving the circumnavigation of the globe by the agency of steam, are circumstances which at the present time give peculiar significance to an inquiry which of late I have been instrumental in agitating, viz., an inquiry into the capabilities of steam-ships of extraordinary magnitude as compared with the capabilities of vessels of ordinary size. Under the influence of these convictions, as to the material importance of this subject, vitally connected as it is with the future advancement of arts, manufactures, and commerce, I beg to be permitted to avail myself of the facilities afforded by the *Journal of the Society of Arts* to promulgate certain inquiries and investigations on the subject referred to, and which, though previously brought forward elsewhere,* have never been subjected to the ordeal of public discussion, such as the importance of the inquiry undoubtedly demands.

Having thus briefly explained the purpose of my communication, I proceed, with your permission, to bring before the notice of your numerous readers the views which I entertain in demonstration.

1st. As to the superior capabilities of large ships, as compared with smaller vessels, in a purely mechanical point of view, for the performance of any specified length of voyage, without re-coaling, at any given rate of speed.

2nd. As to the mercantile limitations at which the admitted mechanical advantage which results from increased size of ship becomes neutralised, if, on the strength of increased size alone, we undertake mercantile obligations involving the stipulated performance of an increased rate of speed, combined with an increased distance without re-coaling, such, for example, as making a long passage direct without touching at intermediate coaling stations, which may be accessible to, and made available by, smaller vessels.

The elemental data on which the following tabular statements have been calculated are as follow, viz. :— That the weight of the hull and equipment (exclusive of the engines and coals), when ready for sea, will appo- priate 40 per cent. of the mean displacement; that the weight of the engines, boilers, &c., in complete working order, will be 5cwt. per indicated horse-power; that the consumption of coals will be at the rate of $4\frac{1}{2}$ lbs. per indicated horse-power per hour; that the type and con-

* Appendix to Atherton's "Steam Ship Capabil- ities" (2nd Edition).

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of shipping, will be as represented by the following Table, No. 5:—

Indicated H.P.	Speed per hour.	Distance 12500 Nautical Miles.	Steaming Time.	Consumption of Coal on the entire passage.	Cargo.	Coal per Ton of Cargo.	Deep Displacement.
4000	14.31	1 stage of 12500	D.H. 36.10	Tons. 17550	Tons. 725	Tons. 24	Tons. 28775
7000	13.36	2 stages of 6250=12500	30.8	9478	3381	4	12340
1500	12.27	4 stages of 3125=12500	44.3	5316	1711	3	5684

From the above table we observe the following results.

Steaming speeds by the above proposed 3 Schemes will be at the rate of about 14, 13, and 12 miles per hour: the steaming time at sea on the 12,500 miles will be about 36, 39, and 44 days for the three Schemes respectively, and allowing 4 days for the 10,000 tons ship (Scheme No. 2) at the intermediate station, and 2 days for re-coaling the one ship (Scheme No. 3) at each of the three intermediate stations, being altogether 6 days: then the time of passage between England and Calcutta by the three Schemes respectively would be 36 days, 43 days, and 50 days; being 14 days shorter time of passage in the case of the one ship (Scheme No. 1) as compared with the three ships (Scheme No. 3); but the Mercantile sacrifice attends this saving of 14 days by Scheme No. 1, compared with Scheme No. 3, is, that by Scheme No. 1, 17,550 tons of coal are consumed in the conveyance of only 725 tons of cargo, being at the rate of 24 tons of coal per ton of cargo, while each of the 4 ships of Scheme No. 3 consumes 5,316 tons of coal in the conveyance of 1,711 tons of cargo, being at the rate of 3 tons of coal per ton of cargo. Thus, notwithstanding the capabilities of large ships as compared with small vessels for performing any special service on special occasions in regard to speed and distance without stoppage (as shown by Tables 1, 2, 3, and 4,) we see, in the case now before us, (as shown by Table No. 5,) that each ship to make the same number of passages in the same time (for, the larger ships, though a shorter time will be detained the longer in port,) that the four ships of Scheme No. 3, as compared with the one ship of Scheme No. 1, is, under the different conditions as to re-coaling stations above stated, capable of trans-acting between England and Calcutta nearly 10 times the weight of cargo per annum with one-eighth the consumption of coal per ton of cargo conveyed, an admitted sacrifice of 14 days on the time of

passage. However, the consumption of fuel on board of ship is not from 4½ lbs. per Indicated H.P. per hour, but from the foregoing calculations have been based, on 3 lbs. per Indicated H.P. per hour, which is theoretically possible, and, therefore, it is hoped, may be attained, on the same principle of calculation and under the above stated conditions as to loss of time by stoppage. So, it would still be found that the four ships of Scheme No. 3, as compared with the one ship Scheme No. 1, would transport about double the weight of cargo between England and Calcutta with about one-eighth the consumption of fuel per ton of cargo conveyed, as before stated, with an admitted sacrifice on the time of passage.

The consumption of fuel per ton of cargo conveyed is, of course, perhaps the best criterion of the merits of different Schemes of Steam Navigation in a mercantile economy; and, on inspecting the above with reference to this point, it will be observed that the 2nd and 3rd Schemes are very nearly on

a par with each other, that is, under the assumed working arrangements of these schemes as above set forth, a vessel of 5,684 tons deep-draught displacement fitted for steaming at 12 knots per hour, and re-coaling at intervals of 8,250 miles, will convey cargo somewhat more economically than a vessel of 12,389 tons deep-draught displacement fitted for steaming at 13 knots per hour, and re-coaling at intervals of 6,250 nautical miles, and as compared with a vessel of 28,775 tons deep-draught displacement fitted for steaming at 14 knots per hour, and making the passage of 12,500 miles direct, without re-coaling at any intermediate station, the difference in point of freight economy, as indicated by the economy of coal per ton of cargo conveyed, is so greatly in favour of the smaller vessel, time excepted, that a vessel working under such conditions, viz., 14 knot speed combined with a 12,500 mile distance, without re-coaling, can only be regarded as a packet-ship for mails and passengers not profitably available for mercantile cargo.

If, however, the ship for Scheme No. 1 be constructed for a deep-draught displacement of 26,000 tons, and be fitted for the reduced speed of 12 knots per hour, the direct passage of 12,500 miles would then occupy 44 days, the consumption of fuel at 8 lbs. per Indicated H.P. per hour would be 12,000 tons, and the displacement available for cargo would be 4,000 tons weight, being at the rate of 3 tons of coal per ton of cargo conveyed, or about the same expenditure of coal per ton of cargo as that incurred by each of the 5,684 tons ship, (Scheme No. 3) steaming at the same speed, viz., 12 knots per hour, but re-coaling at intervals of 3,250 nautical miles, and taking, including stoppages (6 days) for re-coaling, 50 days for the passage; being an admitted superiority of 6 days in favour of the direct passage of the ship of 26,000 tons. The question is, whether this result, viz., the saving of 6 days by the large ship, will adequately compensate for the extraordinary requirements of its realization.

In all the foregoing statements, the mutual relation of displacement, power, and speed, have been calculated without reference to the influence of wind and current, which, indeed, may be regarded as obstructing the regular performance of a high speed service; for, a favourable wind, such as might help a vessel steaming at 12 knots an hour (as in Scheme No. 3), may afford no aid or even oppose a vessel steaming at 14 knots an hour (as in Scheme No. 1); and an adverse wind will obstruct a vessel steaming at a high speed in a greater ratio than it would obstruct the low speed ship.

Sailing clippers scarcely average 7½ knots per hour; an average speed of 10 knots may be expected from the joint action of sail and auxiliary steam-power, but an average speed of 15 knots outruns even a favourable wind, and can only be depended upon from steam alone.

The foregoing remarks presume on there being no limitation to the draught of water whereby the ship of extraordinary magnitude may be prevented from having that type of form, as respects the proportions of length and breadth to depth, which is found to be most conducive to the realisation of a high scale or co-efficient of dynamic duty, and which may be adopted in the construction of the smaller vessels, its rivals. This is one obstacle tending to limit the magnitude of ships, and another obstacle of a somewhat analogous character exists in this, viz., that the cost of the construction of ships, and in some respects the working charges on shipping, are regulated by their nominal tonnage, either builder's tonnage or register tonnage, and it admits of demonstration, that neither the builder's tonnage nor the register tonnage is any definite or proportional measure of the respective weight-carrying capabilities of ships of different proportions of build, but it is found that the shallower a ship is in proportion to her beam, the smaller will be her weight-carrying capability in proportion to her builder's or register tonnage. For example: a ship of 1000 tons builder's measure, which the load-draught of water is one-half of the

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Mid-passenger Displacement.	Speed.
Tonn.	Knots.
5000	15
10000	15
20000	15

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to reduce taxation, any proposal involving an unforeseen expenditure was sure to be regarded with great apprehension, if not disapprobation. This question must, however, be left, rest upon its intrinsic merits; and he thought he had only to be placed in a sufficiently strong form before the heads of her Majesty's Government to induce them to lend a willing ear to the present application. He should consult his colleagues on the subject, and probably it might be well if some gentlemen who took an interest in it waited upon the Chancellor of the Exchequer, as it was a matter involving the expenditure of money.

In accordance with the suggestion of Lord Granville, who are being taken by many influential persons engaged in the decorative trades to obtain such an expression of their sense of the value of this collection, as to render it difficult for the Chancellor of the Exchequer to refuse their request, unless he is prepared to advise Parliament to withdraw all State aid from the British Museum, National Galleries, and other public collections.

FIRE AND POLICE TELEGRAPH.

By SYDNEY S. WATERLOW.

The following is a plan for effecting telegraphic communication between police and fire brigade stations of a metropolis. As these matters are at present under the authority of three distinct bodies, it would be necessary to have a distinct telegraph for each body, perfect in itself, but capable of instantaneously uniting with the other two, so as to form one system in case of necessity in fire or public commotion.

It has long been a matter of surprise and regret, that while the electric telegraph extends itself over the length and breadth of the land, connecting the nearest and the remotest towns of the United Kingdom with the metropolis, its advantages have not hitherto been secured as means of transmitting instantaneous intelligence between the numerous police and fire establishments, which have under their care the protection of life and property.

The immense destruction of property and the melancholy sacrifice of human life by fire, the poverty and the consequent thereon, are subjects deserving the most serious consideration. The existence of such a ready and instantaneous means of procuring assistance in times of danger as the electric telegraph affords, would impart, it were, a new feeling of security to the inhabitants of large and densely populated towns.

The City of London, built as it is upon an undulating ground, is peculiarly favourable to the development of systems of over-house telegraphs. The plan has been successfully adopted in New York, Paris, Brussels, and in other large continental towns. In America, wires have been carried upwards of a mile without any intermediate support, and have now been in operation several years.

In advocating a plan of over-house telegraphs, I have desired to depreciate the merits of the under-ground system, except on the score of expense, the difference in this respect is enormous, and the City would entail on itself a perpetual source of annoyance to the public in its adoption. When the under-ground wires are used or become impaired, it is difficult to find the locality where the mischief arises; but if any accident should befall the suspended wires, the injury could be immediately discovered and as speedily repaired. To have an impaired wire would be only the work of an hour, while if it were under-ground, its repair would be the work of days, besides the annoyance of shopkeepers, and the interruption of traffic occasioned by opening the streets.

It being understood that an

signal would instantaneously appear on the telegraph dials at every police and fire brigade station in the metropolis. The exact locality of the fire, its extent, the number of engines and police required, would be immediately transmitted to all or to particular stations according to circumstances. Should the fire be extinguished, notice could be sent, and the engines stopped, or they might be intercepted by the police, or by information to be obtained at any fire or police station on the way. False alarms could not, as at present, harass the brigade, or impose unnecessary trouble and expense in dragging out engines and fire escapes when not wanted.

When a fire breaks out now, the police, or any person who may happen at the time to be present, hastens to the nearest fire station, which may be a long distance from the scene of the conflagration, and then from the station messengers are again sent to all the others. Sometimes, at night, the reflection gives the alarm, and is the only guide, though too often a deceptive one, the firemen have to direct them to the spot where their services are required. All these proceedings occupy much time; and often, before the engines have arrived, the premises are entirely destroyed; in other cases, the fire has been subdued, and in others the alarm is found to be false. Nevertheless, engine after engine continues to arrive, to no purpose, when (and such has been often the case) other fires are raging in the very neighbourhood from which they have been unnecessarily withdrawn. The telegraph, as already observed, would be the means of concentrating at any required spot the whole power of the brigade; and the authorities at the chief fire station in Wapping-street, or the chief police station in Old Jewry or Scotland-yard, would be enabled to regulate the movements of their men as accurately as if they were under their own eyes—a system which cannot fail to result in the saving of much trouble, expense, an immense amount of property and human life. It has been very truly observed, there can be no doubt that in many a half-hour, occupied by messengers, &c., a larger amount of property has been destroyed than would have been paid for constructing a most efficient and complete telegraphic system, embracing the whole of the metropolis. Of the truth of this, the fire at Camden Town affords a ready illustration.

Although, to an observer, the working the telegraph may appear complex and difficult, it is in reality but a question of practice, as the young men upon the railways are very soon trained to transmit messages in an expeditious and accurate manner, in addition to their other duties.

Having thus endeavoured to point out the manner in which the electric telegraph may be beneficially and advantageously applied to the purposes above described, I sincerely trust that, however inadequate this attempt may be, the public will give the subject that fair consideration which its importance demands; feeling sure, that if the scheme is well considered, the day is not far distant when it must be carried out.

Carpenter's-hall, London Wall.

ALLEGED INFLUENCE OF SOLAR LIGHT ON COMBUSTION.

Some researches on this subject have lately been made by Dr. J. Le Conte, Professor of Natural Philosophy in South Carolina College, U.S., and the results were embodied in a paper* read before the American Association for the Advancement of Science. The following is an abstract of the paper:—

A popular opinion has long prevailed that the admission of the light of the sun to an ordinary fire tends to retard the process of combustion, and even ultimately to put it out. About thirty-two years ago Dr. Thomas M'Keever published a series of experiments in the "Annals of Philosophy" (new series, vol. 10, p. 344),

rate of burning on different days varies according to combined effects of barometric and thermometric changes, and he finds that the rate of combustion increased in a higher ratio than the density of the air, and he concludes that some other agency must have acted in these cases.

Excluding Mr. Mitchell's experiments, he finds that the rate of burning increases in a higher ratio than the density of the air, while the influence of atmospheric density in the rate of combustion is clearly demonstrated.

Le Conte concludes his paper by saying,—

From the foregoing discussion it is evident that the subject needs a thorough experimental investigation, with a minute knowledge of all the external conditions which may influence the result. This I propose to undertake during the next year. In the mean time it is hoped that these preliminary researches may prepare the way for a clearer apprehension of the difficulties which are to be encountered. Perhaps, at the present stage, we may be warranted in deducing conclusions; let, that solar light does not seem to exercise sensible influence on the process of combustion; and 2ndly, variations in the density of the air do exert a striking influence on the rate of burning, accelerating the rapidity of the process, and augmenting with every increment of density the rate of burning; but the exact ratio between them remains to be ascertained.

COPPER IN THE SEA.

The following is extracted from the *Scientific American*.

Five years ago, two French chemists demonstrated that the ocean contained a notable portion of silver. Recent years and other philosophers have again been at work on the same subject; following it up, however, much more fully, they now tell us that, calculating the whole of the ocean, it cannot contain less than two millions of tons of silver in solution. The truth of this statement is verified by experiments tried at various parts of the world—one of them, the most recent, was made by Mr. Field, an English chemist, who lives at Coquimbo, in Chili. The water he used was taken from the Pacific Ocean, and afforded the same result as that which the French chemists obtained from the water taken off St. Malo, France, in the English Channel. That the ocean should contain minute quantities of every substance of the globe that is soluble in water is not surprising; therefore we are, in a measure, prepared for the further discovery that the "blue" ocean, contains also an enormous quantity of copper—a fact recently proved in the laboratory of Mr. Septimus Piesse. The beautiful blue colour of the Mediterranean Sea is due, he says, to the presence of a minute salt of copper, while the greenness of the sea is owing to the chloride of copper. The process of extracting silver from the sea is one of simple gravity. Gravelated copper being suspended in the waves, any silver salt that is contained therein is precipitated, a portion of the copper is dissolved, and the silver is precipitated thereon, from which it is afterwards separated by the usual means adopted in every laboratory. By a happy analogy, Mr. Piesse separated copper from the sea by the same process. His experiments were conducted between the ports of Marseilles, on the French coast, and Nice, in Sardinia. A bag of scrap iron was suspended at the side of the ship, which was towed between these places, and after the passage (about twelve hours), copper was indicated by the iron. Four separate voyages, however, were made before the bag of iron was removed to the laboratory; then the quantity of copper was found to be so great that much surprise was shown that the amount of this metal had not been previously discovered, especially in the action of sea water on ships' bottoms has been known. Mr. Piesse is continuing his experi-

SOUTH KENSINGTON MUSEUM.

During the week ending 19th December, 1867, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,660; on Monday and Tuesday (free evenings), 3,767. On the three students' days (admission to the public 6d.), 530. One students' evening, Wednesday, 125. Total, 7,082.

Home Correspondence.

FOOD GRAINS.

SIR,—All the writers on this subject seem to be very much mystified when the hard wheats of the warmer climates come under consideration in respect of their value as a material for the production of flour.

Hard wheat, properly so called, is never made use of by the natives for the production of flour in a separate form, nor can flour be made from it except under certain circumstances.

The primary use of hard wheat is that of grinding it into *semolina* for the manufacture of *macaroni*, which is never made from flour. When a grain of hard wheat is dissected, no flour, or the material of which it is made, is found in the interior, the whole of its substance being composed of a semi-transparent horny matter, easily convertible into *semolina* by rather coarse grinding.

When hard wheat is to be ground into flour, it is only used in a mixture composed of the following articles, in nearly equal proportions, viz., soft wheat, hard wheat, barley, broad beans, from the coast of Barbary, Indian corn, horse beans, field peas, vetches, &c., &c.

The mixture is ground in powerful water-mills, that is, those that have heavy hard millstones, sharply dressed, and capable of grinding the whole of such a heterogeneous composition, cuticle included, into tolerably fine flour or meal, with very little bran in it, and that not always sifted out.

The bread made from such flour rises well, and is very nutritious and sustaining, but it is very dark, sometimes almost black, and is universally the food of the farmer and his labourers, and others of that class.

I am, &c., HENRY W. REVELEY.

COAL AND COKE.

SIR,—The very interesting discussion arising out of Mr. Apsley Pellatt's paper, "On the Comparative Heating Powers of Coal and Coke," appears to be profitably continued in the Society's *Journal*. Among the communications on this subject, in yesterday's number, I find a letter from Mr. Henry W. Reveley. There are so many sound views taken in that letter, that I regret having to object to any. The writer, however, quoting from my "Prize Essay," appears to have so mistaken my views on some points, and even to have somewhat severely commented on the same, that I request permission to put the matter right before the Society.

Mr. Reveley says, "In the well-known 'Prize Essay' on this subject, by Mr. C. Wye Williams, there is scarcely an allusion to the subject of ashpits, and none whatever to the possibility of half the mischief being caused by their very faulty construction." So far, however, from that being the fact, among "the respective duties which each part of a furnace or boiler has to perform," the second head for examination is, "of the ash-pit and the area below the fuel," the first being, "of the chamber of the furnace and the area above the fuel."

Treating of the area in the chamber of the furnace, I have dwelt on the "chemical and mechanical reasons for providing an enlarged chamber." As a practical rule, I have even given the required proportions, and have commented strongly on the want of adequate space. On the



Howden, Tuxford and Dean, the pioneers of the engine, surely deserve a passing word as much as Tull, Leake, and others; but I, in common with others, am much surprised at the entire omission of Tuxford's name, a firm which has, for nearly three years, held the chief prize for these engines, and whose make of engine is distinct from any other. The name of the town ofoston, too, was not thought worthy to be given with the others,—the birth-place of the portable engine and portable steam-threshing machine. What has a railway telegraph station to do with portable engines, whose portability and readiness of application to any purpose where steam-power is applicable, are available in any place? Fixed barn works may be influenced by this use, in the expense of carriage, but not portable engines and other portable machines.

If Mr. Sidney had paid a little more attention to "antiquarian curiosities" and "mechanical toys," some errors might have been avoided in his paper, as also the charge of mentioning certain parties and omitting others. The steam horse of Boydell, and the cultivator of Romaine, the rotary plough of Usher, the ploughing system of Williams, and the high-pressure engine of Collinson Hall, are "mechanical toys" deserving notice, mechanically in their details and realised facts, yet entirely omitted.

Opinions have been lately invited and freely given as to the prizes offered by the Royal Agricultural Society, and if this Society has been the means of raising "small lackmishes into large engineers," Mr. Sidney may rely upon it that the judges would never have awarded prizes to their productions without satisfying themselves that the implements were required and were the best of the kind. Witness his own remarks on Crosskill's clod-rubbers.

While touching upon haymakers and other implements, he omits all mention of mills; surely this was an oversight, as they are among the most useful implements of a farm.

The remark about the plough, seen while hunting in Essex, would have been better omitted. Perhaps, as a traveller, he had time to examine the mode of culture and tools employed; at any rate, if he sums up his knowledge of agricultural implements at present as he has done, and gives that as containing his opinions, I beg leave to refer him for some further information to some papers of mine read before the Institution of Mechanical Engineers at Birmingham last year, and this, on the application of steam-power to agricultural purposes, where he will find facts and results that may surprise him; or, perhaps, the forthcoming work on the machinery of the farm, by Stephens, may be worth a place in his library.

For the Scotch, I claim the invention of the threshing machine (combined) and the Scotch plough. To these Mr. Caird has added the horse hoe and reaping machine—may I also add the steam plough?

I must apologise for intruding my remarks upon your notice, but believing that some reply was called for, I venture to solicit a place for this in your *Journal*, and I am, &c.,

WILLIAM WALLER.

Edinburgh by Glasgow, Dec. 14, 1857.

Proceedings of Institutions.

DARLINGTON. — In order to raise funds for the purchase of new books, the committee of the Mechanics' Institution organized a grand soiree, which took place in their hall on Tuesday, the 1st of December. About 850 attended. Messrs. Pease, F. Mewburn, junr., and other friends contributed pictures and engravings. The Government School of Art sent examples of their successful pupils, and Mr. Shennessy, gardener to John Harris, Esq., decorated the room with garlands. About twenty-eight ladies and friends of the Institute contributed the

repast, and many of the former assisted at the tables. £17 13s. 6d. was taken at the door. The Darlington Philharmonic Band lent their services for the occasion. Henry Pease, Esq., M.P., President of the Institute, occupied the chair, and delivered an introductory address, treating generally on the past history and present objects of the Institution. He then called upon the Rev. J. G. Pearson, who spoke of the benefits resulting from Mechanics' Institutions, and the remarkable progress made by them of late years in public estimation. He was followed by Captain O'Brien, who spoke to a similar effect. Mr. Francis Mewburn, junr., then addressed the meeting, dwelling especially upon the connection of the Institution with the Society of Arts, and giving an outline of the history of that Society. Mr. Mewburn enlarged upon the advantages resulting from the Society's Examinations, and explained the system as set forth in the programme just issued. Mr. Joseph W. Pease, and Mr. F. L. Kipling, then addressed the meeting, which separated after passing the usual votes of thanks.

HOLBECK (NEAR LEEDS). — On the 24th November, a lecture, on Durham Cathedral, was delivered before the members of the Church Institute, by the Rev. N. Greenwell, B.A. The history of this venerable and stately pile was traced, by the lecturer, from the earliest period down to the death of Bishop Van Mildert. The lecturer described the building as having been founded in 1069. Its length, including the western porch, is 507 feet, and its greatest breadth 200 feet. It has a central tower 214 feet in height, a fine west front, with a Galilee chapel, and two richly ornamented towers 143 feet in height. The lecture was illustrated by a ground plan and elevation of the edifice, and every portion of the building was briefly described. Mr. Greenwell gave a description of the funeral of the last Prince Palatine, of which he was an eye-witness. Some well executed drawings of the Old Monks, St. Cuthbert's Banner, and the cruel Earl Cassilis, added considerably to the interest of the lecture. The attendance of members and friends, notwithstanding the unfavourable state of the weather, was remarkably good.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Dec. 18, 1857.]

Dated 11th August, 1857.

2147. Richard Husband, Manchester—An improvement in the manner of fastening of hats.

Dated 2nd November, 1857.

2784. James Apperly and William Cillesold, Dudbridge, Gloucestershire—Improved means of and apparatus for feeding fuel to furnaces.

Dated 3rd November, 1857.

2794. Anthony Charles Sacré, Brussels—An improved apparatus for measuring water.

Dated 24th November, 1857.

2842. Frédérique Lemaire, Tavistock-street, Covent-garden—An improved petticoat for ladies' wear. (A communication.)

2844. Frederick Herbert Maberly, Stowmarket, Suffolk—An improved general polishing machine or apparatus.

2846. Camille Bernard, 39, Rue de l'Echiquier, Paris—Certain improvements in heating apparatus. (A communication.)

2848. Edmund Charles Tisdall, Holland Park Farm, Kensington—Improvements in the mode of preserving animal and vegetable fluids, and fluids containing animal and vegetable substances.

Dated 24th November, 1857.

2850. William Blinckhorn, Sutton, near Saint Helen's, Lancashire—Certain improvements in machinery or apparatus for grinding and smoothing, and for polishing glass.

2852. John Frederick Shoner, 4, Church-street, Kennington—Improvements in common road carriages.

2854. Joseph Ruston and James Toyns Proctor, Lincoln—An improved arrangement of machinery for dressing grain.

Dated 21st November, 1857.

2856. William Bowers Taylor, Ballymena, Antrim, Ireland—Improvements in driving looms for weaving.

Dated 24th November, 1857.

2860. Benjamin Peach, Leicester—Sundry improvements in bedsteads, especially bed bottoms, the seats of chairs, sofas, and other similar articles. (A communication.)

2864. Antoine Alphonse Chassepot, Paris—Improvements in breech-loading fire arms.

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Journal of the Society of Arts.

FRIDAY, JANUARY 1, 1858.

COPYRIGHT IN FINE ART.

A Committee on this subject has been appointed by the Council, consisting of Jacob Bell, F.L.S., John Bell, D. Robertson Blaine, F. S. Cary, E. Chalon, R.A., A. Claudet, F.R.S., Henry Cole, C.B., D. Colnaghi, David Cox, junr., H. Darvill, C. Wentworth Dilke, George Thomas Doo, R.A., Wm. Dyce, R.A., Sir Charles Eastlake, P.R.A., James Fahey, Roger Fenton, Wm. Gladgate, George Godwin, F.R.S., Lewis Haghe, Wm. Hollowes, S. A. Hart, R.A., J. R. Herbert, R.A., F. Y. Hurlstone, President of the Society of British Artists, Owen Jones, J. P. Knight, R.A., R. S. Lander, President of the National Institution of Fine Arts, John Leigh, J. F. Lewis, President of the Society of Painters in Water Colours, J. Linnell, D. Maclean, R.A., Wm. Mulready, R.A., Matthew Noble, F. R. Pickersgill, R.A., R. Redgrave, R.A., Sir Wm. C. Ross, R.A., George Scharf, junr., John Scott, Bell Smith, Fred. Tayler, Wm. Tooke, F.R.S., E. M. Ward, R.A., H. Warren, President of the New Society of Painters in Water Colours.

The Committee has met twice. At its first meeting, on the motion of the Chairman of the Council, Sir Charles Eastlake, P.R.A., J. Lewis, Esq., President of the Society of Painters in Water Colours, and D. Robertson Blaine, were unanimously chosen respectively Chairman, Deputy Chairman, and Reporter of the Committee.

The following resolutions have been passed by the Committee:—

Resolved,—That the enquiries of this Committee be directed,—

1. To ascertain the existing laws of British Artistic Copyright, and the chief defects of those laws.
2. How those defects affect the interests of producers of Works of Art.
3. How they affect the interests of purchasers of Works of Modern Art.
4. How they affect the interests of the public and the promotion of the Fine Arts.
5. How they affect the subjects of those Foreign States with whom Her Majesty has entered into International Copyright Conventions, and the laws of those States as affecting Artistic Copyright.
6. To obtaining instances of fraudulent or wrongful acts relating to Works of Modern Art.
7. And lastly, to suggest such remedies as appear best calculated to amend the defects of our Artistic Copyright laws.

Resolved,—That copies of the Resolution now passed be distributed to such societies and individuals as may be suggested by the Committee, it being understood that, with the exception of No. 6, the various points will be made known, in order to show to what objects the Committee propose to direct their attention, and that as regards No. 6, full and distinct answers will be requested.

PURCHASE OF THE SOULAGES COLLECTION.

The Council have acceded to the request to hold meetings in the Society's rooms, preferred by an Association of Art trades, which has been formed to urge upon Government the necessity of securing the Soulages Collection for the improvement of the decorative manufactures of this country. This association consists of the Mayors of Manchester, Birmingham, and other towns, and of the most eminent art manufacturers both in London and the provinces. Mr. J. G. Crace is the Honorary Secretary, and will receive any correspondence on the subject.

DETECTION OF VEGETABLE SUBSTANCES MIXED WITH COFFEE FOR PURPOSES OF ADULTERATION.

The following are the results of investigations made by Professor Graham, Dr. Stenhouse, and Mr. Dugald Campbell, and embodied in a report made by them to the Board of Inland Revenue. Their remarks apply to coffee in a roasted state, as it is in that condition alone that it is made use of. The roasting gives new properties to the bean. The woody tissue of the fresh bean is horny, and differs from ordinary woody fibre in its composition, and is also said not to yield sugar when treated with sulphuric acid. By the roasting, this woody tissue undergoes a partial decomposition, and becomes friable, and the difficulty of pulverising the seed, and exhausting it by water, is removed. There is produced at the same time a soluble brown bitter matter, due in part to a gummy substance pre-existing in the coffee, altered like starch by torrefaction, but principally to the conversion into caramel of a quantity of sugar in the coffee-bean, amounting to 6 or 7 per cent. of its weight. In addition to this there is the aroma produced by the roasting, arising from a brown oil termed Caffeone, so powerful as that a quantity which is almost insensible will aromatize two or three pints of water. There appears to be no seed which when roasted and ground forms a true equivalent and sufficient substitute for coffee, either physiologically or chemically. A great variety of seeds were tried in France, as substitutes for coffee, during the continuance of the continental blockade, including, in addition to maize, barley, oats, and the other cereals, the seeds of the yellow flag (*Iris pseudo-acorus*), grey pea (*Cicer oriatium*), the milk vetch, or Andalusian astragalus (*Astragalus boeticus*), the *Hibiscus esculentus*, holly, Spanish broom, acorns, chestnuts, the small lupin (*Lupinus angustifolia*), peas, haricots, horse-beans, sunflower, pips of the gooseberry and grape, eglantine (*Rosa villosa*), and the capsules of box (*Buxus sempervirens*). Of the seeds enumerated, the yellow flag, a common marsh plant in England, appears to have offered the only similarity to coffee; but it is doubtful whether the resemblance extended beyond the aroma of this seed when roasted, which is certainly suggestive of coffee. The search made among the seeds of other plants for a substitute for the coffee-berry may then be said to have entirely failed. The root substituted differs still more widely from true coffee, except in one property, namely, sugar. The roots most used have been those of chicory (*Cichorium intybus*), carrot, beet, rush-nut (*Cyperus esculentus*), earth-nut (*Arachis hypogæa*), scratch-weed (*Gallium aparine*), fern (*Polypodium filix mas*), and butchers'-broom (*Ruscus aculeatus*). These roots are more generally used as additions than as substitutes. It is to their all containing sugar, easily caramelized by heat that their use may be attributed. This flavour of burnt sugar appears to be a general favourite in our beverages. No one of these ro-

[illegible]

The only other substances besides coffee in which caffeine is known to exist, are tea, Paraguay tea, and a species of chocolate made from the *Garcinia officinalis* or *Poultia cordata*.

[illegible]

position of its ash, which have both been sufficiently adverted to. The proportion of fat naturally in the root is quite insignificant. Chicory, however, as well as the other several roots, such as turnips, beet, &c., present little that is tangible in their chemical properties. The high colour of the infusions of all these roots when roasted, the great density of their solutions, and their fermentability, afford sufficient means for distinguishing them from coffee, and for discovering their admixture with that substance.

ON TEACHING PHYSIOLOGY AND ITS APPLICATIONS IN COMMON SCHOOLS.

The following is the substance of a paper prepared by Mr. George Combe, of Edinburgh, to be read before the National Association for the Promotion of Social Science. The author says:—

"In one respect, physiology may be said to be a science only in its infancy, and in another, to be already so far advanced as to be capable of valuable practical applications. This apparent paradox admits of an easy solution.

"The most learned physiologists are still in a state of profound ignorance concerning the intimate processes carried on in the tissues of the human body, which produce the phenomena of life. This knowledge, nevertheless, is indispensable to raise medicine to the dignity of an exact science; and as it has not yet been attained, some persons represent the healing art as one of a purely empirical character; and physiology, on which it professes to be founded, as at present a chaos of conjectures.

"But, on the other hand, it is undeniable that much is known concerning the structure, functions, and conditions of health of the vital organs, as well as concerning many of the causes of their abnormal action; and on this knowledge medical practitioners found a treatment of disease that is at once rational and beneficial. But the same knowledge is available for the preservation of health, and for the advancement of social well-being in other departments of life, and on this account it may be made an important branch of instruction in common schools.

"A few elucidations will suffice to show the manner in which it has been successfully taught in some seminaries, to children and young persons, of ten years of age and upwards, and also the applications to practical conduct of which it is susceptible."

To prevent misapprehension, the author begs to state that he does "not recommend physiology to be taught in common schools in the form of lectures, but in that of lessons, in which the children themselves shall take a part, and in which there shall be a constant interchange of remarks, question, answer, and inference, between the pupils and their instructor. Moreover, in these lessons no attempt should be made to teach the science or practice of medicine."

"In an ordinary medical education instruction is given in the following branches.

"1st. Anatomy, or the structure of the human body.—The teaching under this head embraces descriptions of every bone, muscle, nerve, and viscus in the body, with their attachments and connections, so minute that the student may know how to discover their position; and how to recognise abnormal changes in them in living subjects, with a view to medical treatment, or, if necessary, to operate on them.

The author does "not recommend teaching at all approaching to this in detail, nor with a view to these objects."

2dly. Physiology, or a scientific description of the functions of every cell, tissue, bone, nerve, muscle, and viscus in the system, according to the profoundest views of the most recent investigators.

The author does "not recommend teaching physiology in this manner."

3dly. Pathology, or the diseased structure of every cell, tissue, bone, and viscus of the body.

The author does "not recommend this instruction to be given."

4thly. The practice of physic, or the application of all the foregoing branches of knowledge to the diagnosis and cure of disease.

"This is not recommended to be introduced."

"This statement of negatives is made because medical men in general, to whom the directors of schools naturally look for advice, have these modes of instruction in their minds (few of them having seen any other in operation), when they deliver opinions on the propriety of introducing physiology into schools.

"The kind of instruction recommended, and which has already been successfully taught in some seminaries, may now be mentioned. The plan of it is this:—A description of the various organs of the human body on which health and life depend, is given in simple and popular language, but scientifically correct, so as to avoid sowing error in the mind of the pupils; the use or function of the part is described in the same manner, the exposition being plain and popular in language, but in principle sound and scientific, challenging the criticism of the highest medical investigators. The influence of the different organs on each other is then explained; and the knowledge thus communicated of the structure, functions, and relations is applied to elucidate the natural conditions on which the healthy and unhealthy action of each vital organ depends; in other words, the causes of good or bad health, and the means that should be used in our daily habits to secure the one and avoid the other. The practical application of this knowledge lies, in a greater or less degree, within the power of every intelligent person, and much disease and suffering in ordinary life may be avoided, and much substantial enjoyment gained by acting on it."

"The instruction concerning the use of each organ is founded on its structure and its relations to the other organs; and the structure is described in other words, and as far as possible illustrated by preparations and by diagrams. It is generally acknowledged, that not children only, but adults also, more easily and distinctly comprehend, and longer remember, an object after having seen it, and heard it at the same time clearly described, than by merely reading about it. Now, the object in introducing the human skeleton and diagrams of the muscles, lungs, heart, and blood-vessels, and other vital organs, into schools, and giving *visu voce* descriptions of them, is to do effectually what a book is capable of accomplishing only imperfectly, namely, to convey to the pupils correct ideas of the structure, so extensive as to serve as a solid basis for understanding the uses or functions of the parts, and the influence of the vital organs on each other, and on the whole corporeal system; in other words, to understand the natural conditions on which health depends, and the causes which produce disease.

"The use or function is far better understood when founded on a demonstration of the structure than when communicated merely by verbal description as a general and unsupported fact. Actual knowledge of the structure and functions renders the relations of the vital organs to each other intelligible, and their reciprocal influence highly interesting;—for example, it enables us to comprehend the influence of the digestive organs on the power and activity of the muscles, lungs, and brain; the influence of the brain over the heart, the lungs, and the stomach; the influence of the circulating fluids in forming, supporting, and repairing the waste of all the organs; and so forth. And, as already remarked, this knowledge of the structure, functions, and relations of the vital organs all combined, lays the foundation for a clear exposition of the laws of health, by teaching which, we point out the course of action which every individual should habitually observe in order to promote his usefulness and prolong his enjoyment of life.

"The sexual organs and functions are omitted in the lessons and diagrams, and it is not found thv

the collection at present deposited at the St. Thomas's Hospital Schools, by the kind permission of the Rev. William Rogers.

"It is with much gratification we report that in May the sum of £100 was most liberally placed at the disposal of the Association by a distinguished promoter of education, to be applied in giving a prize of £25 for an Essay on "The best means of making the Schoolmaster's function more efficient than it has hitherto been in preventing misery and crime," and in promoting the publicity of the Essay,—the remainder being carried to be general funds of the Institution. Your committee accordingly took steps to make the offer extensively known, and as many as thirty Essays were sent in by the appointed date, the 1st of November. The writer was required to direct his attention particularly to the following points:—1. The subjects to be taught. 2. The method of conducting the teaching and training. It was also stipulated that the copyright of the successful Essay should become the property of the Association. The adjudicators were the Rev. Dr. Booth, your corresponding secretary, and Mr. Shields, who were nominated respectively by the Council of the Society of Arts, your committee, and the donor. The prize has been awarded to Mr. E. C. Tainsh."

It appeared that, owing to this munificent donation, the Association had been entirely released from debt, and, after paying all the expenses connected with the Prize Essay, would probably have a small balance in hand.

At 3.30 p.m., Mr. H. Seymour Tremenhare, Inspector of Mining Districts, gave an address on "Associations offering Prizes to be competed for by groups of schools, commonly called Prize Schemes; and on a proposed Public Examination of all boys leaving the Day-school finally, who may choose to present themselves for examination." Mr. Tremenhare, after explaining his proposed scheme of examination, requested the Association to give it their consideration, and to report to him his opinion upon it. The matter was accordingly referred to the Acting Committee.

At 6 p.m., the Rev. W. Taylor Jones, M.A., Vice-president of the College of Preceptors, delivered an address, "On the Prospects of General and Comprehensive Union among all ranks of the Scholastic Profession." An animated discussion followed.

At 7.30 p.m., Mr. John Ogle delivered a lecture on "Thoroughness in Education." A discussion followed. On Tuesday, at 2.30 p.m., Mr. R. Bithell gave a lecture on "The Objects sought by Association among schoolmasters."

At 3.30, Mr. T. Crampton gave a lecture on "Political Economy as a Branch of Education."

At 7, the chair was taken by Mr. Henry Cole, C.B., one of the Secretaries of the Committee of Council on Education.

A very full meeting of teachers and promoters of education assembled to hear the above-mentioned Prize Essay read by the writer. The Chairman, after briefly explaining the circumstances connected with the offer of the prize, handed to Mr. Tainsh a cheque for £25, the amount of the prize, and called upon him to read his Essay. In the course of the reading, Mr. Tainsh was very much applauded. A discussion ensued, in which the following gentlemen took part:—Mr. Tate, Dr. Hodgson, Manchester, Mr. Williams, of the Midland Institute, Mr. Shields, Mr. Coghlan, Mr. Drew, and Mr. Tilleard. At the motion of Mr. William Ellis, a vote of thanks was given to Mr. Cole for his excellent conduct in the evening. The meeting separated at 10 o'clock. Among those present at it, were the Rev. William Rogers, the Rev. Dr. Poggi, Principal of New Brighton College, Mr. Wood, of the Royal Military Asylum, Chelsea, Mr. Galt, of the Wesleyan Normal College, &c. The Essay, together with a report of the discussion, will be published for circulation among the members, and for sale.

SOUTH KENSINGTON MUSEUM.

His Imperial Highness Prince Napoleon has transmitted to the Committee of Council on Education a very interesting specimen of Gobelin tapestry, the subject being, "Arria presenting the dagger to her husband, Pœtus, after having stabbed herself." This piece of work was commenced under Louis XVI., was completed during the period of the Republic, and received its border in the early days of the first empire. It was given on his marriage, in 1807, to Jerome, King of Westphalia, by the Emperor, his brother. Prince Jerome has just given it to his son, Prince Napoleon, in order that it might be presented to the Museum of Art at South Kensington, as some proof of the interest which they both took in that establishment. Viewed for its money worth, this specimen must have been valued at above £2,000, but looking to the curious facts of its history it is of far higher value, as an evidence of the friendly relations which have sprung up between the two countries, not merely in politics, but in the promotion of the arts.

During the week ending 26th December, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 6,166; on Monday, Tuesday, and Saturday (free evenings), 3,244. On the three students' days (admission to the public 6d.), 378. One students' evening, Wednesday, 70. Total, 9,848.

NEW PROCESS OF MAKING BREAD.

Some months ago a new process of bread-making was patented by Dr. Daughlish, of Carlisle. The theory has been reduced to practice; and a machine on the new principle is now in operation. According to the ordinary process, fermentation is produced by the action of the yeast upon the particles of starch in the flour, thus liberating minute bubbles of carbonic acid gas, which permeate the entire mass of the dough, and make it "rise." The chemical change, however, which here takes place is such that it has been estimated by M. Dumas that in France 17½ per cent. and in England 8½ to 12 per cent. is wasted by the decomposition which takes place in the process of fermentation. In the new process patented by Dr. Daughlish no yeast or baking powder is used, the rising of the dough being effected by water impregnated with carbonic acid gas. The idea of making bread with aerated water is not a new one; a patent was taken out for such a process some years ago, but it was then found that when the flour was mixed with the impregnated water, the gas escaped before the bread had time to rise. The novelty of Dr. Daughlish's patent consists in preventing the escape of the gas from the water by subjecting the materials to an outward pressure of carbonic acid gas while the flour is being mixed with carbonated water. The carbonic acid gas is generated in such apparatus as is usually employed by soda-water manufacturers; the gas is pumped into a large reservoir, from which it is forced, as it is required, into a vessel containing water—the absorbing power of water for carbonic acid being very great. The kneading machine is a strong iron retort, fitted with air-tight lids, and provided with revolving prongs in the inside for mixing the dough. In the machine now in operation, this retort is capable of containing 40 stones of flour. Into this are put 20 stones of flour with the requisite amount of salt. A stream of carbonic acid gas is forced into the retort, and a sufficient quantity of carbonated water is admitted, and well mixed with the flour and salt; the gas with which the water is impregnated being prevented from escaping by the pressure of the carbonic acid gas. As soon as the flour and water are mixed, a pipe is opened and the loose gas is let out. The consequence of the pressure being taken away from the surface of the paste is, that the gas which was held in solution by the water operates in precisely the same manner.

as the gas in a bottle of soda-water when the cork is removed. The water then fills the retort, occupying nearly as much space as before. The bread is then ready to be baked, and this is the only operation that will require any attention. The rising can be regulated by the strength of the machinery, and the bread might be made almost any lightness. The quantity of the gas, and the quantity of water added, are regulated by gauges.

The Correspondence.

THE EXAMINATION QUESTION.

The Society of Arts, Manufactures, and Commerce is a body established for the promotion of science, and is chiefly by the examination of students in the art of the nation, for which they awarded prizes. It is an educational body, other than a body for the promotion of improvement, by practical and scientific instruction therefrom.

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ners round, provided always that the means be forthcoming. If the examined be few, there seems no reason why they should not attend in London, at the cost of their respective Institutions. It is apparently considered by Mr. Baines and others, to be of importance to obtain the special fiat of the Society's Examiners, in preference to a local Examination, and, if so, the expense should be borne rateably, and not wholly saddled on the subscribers to the London Society. There seems to be no reason why the competitors in the provinces should settle on the proficiency of their best members, and send them up to London for confirmation.

But there is the question of the *cui bono* to consider. Study for its own sake is its own reward. *Argo*, people desiring public examination do not study for the sake of study, but for some other reward, either the reputation for the sake of reputation, or the reputation for the sake of employment and promotion. If the Society gives certificates, those certificates are supposed to obtain a preference with employers. This supposes that employers are not competent to examine for themselves. If this be so, then the practical results of the system carried to its full extent would be to fill up all employments with stereotyped officials. Now, this would be to perpetuate a dead level,—to create a nation of China. It is very certain that the routine which grows by custom, has a constant tendency to perpetuate itself, and to be a drag on progress. In all departments, the proportion of eminent men are outsiders, irregular, and who have casually hit upon their natural aptitudes for these vocations, and such men constitute our national superiority. For example, it was not Examination that produced a Faraday, but absolute love of study and progress. Public bodies for the most part only represent average men; the *élite* of progress are ever beyond the average, and the greatest of all faculties, energy, *i.e.*, the great faculty in natural progress, no examinations can determine on. Unnatural energy is sometimes developed by a University Examination on abstractions, which lead the competitor not uncommonly a wreck for life.

The country of maximum Examination is, probably, China; the country of minimum Examination and hazard is England. How far an extended system of examination in England will stimulate, and how far it will induce very respectable mediocrity is well worth an experiment, and it would be well for the Society, while keeping a record of those who take prizes, to keep also a record of their after-progress in the actual business of life. Self-taught men rarely seek for examination; they value their knowledge rather than display it, and it may be worth while to consider how far Examination is valuable other than as patronage. If it be patronage, there is the chance of its degenerating into mere favouritism and routine. How many Examiners can be found, earnest as well as intellectual men, if the system of Examination is to become universal, to ensure that only the worthy obtain the prizes? I can understand a select body of men doing well, but not the mass. Every human being is an individual, and to test all individuals by the same set of questions would be a fallacy. The examiner should be a moral as well as intellectual philosopher; he will only be a kind of grinder's tool, a hard material, and, inasmuch as the world, after all, is ruled by instincts and sympathies more than by mere brains, it is quite possible that the system of examinations should develop more than mechanical servants, except under the care of certain select guides and first-class philosophers. The possession of godlike attributes in a teacher, independent of similar faculties to gather round him, but cannot create them. Numerous students will study hard to pass an examination, some in one branch, some in many, but it is by no means certain that the enthusiasm of the hard work will be of that kind which goes through life; the soldier who will be prominent in the breach is not commonly the one who will best discharge his duty.

It cannot be doubted that oral examinations, in conjunction with written ones, will be best adapted to bring forth existing faculties, but it may be doubted if oral examinations, without written ones, should be held sufficient. If a man possesses faculties, and no utterance, he is not an efficient worker; and faculty of utterance, either by writing or speech, if not by both, should be held as part of the qualification for passing. But the oral examination should be held rather as a test of the truth of the writing—that it is the writer's own production, and not mere cram—than as any proof of positive skill.

I, for one amongst many members, say, let the examinations go on in abstract knowledge as well as in indirect material results—to the full extent of the Society's funds and power, and let the examiners be paid; but let the house of the Society be the sole seat of examinations, ever which both Council and members may watch. There does not seem to be much difficulty in the matter. Let the candidates prepare their papers, which can be attested and sent up to the examiners. From these, those worthy of prizes can be selected, and the writers can then be sent up at the expense of their respective Institutions for oral verification. This would meet all the circumstances of the case;—would give more than the *edict* of peripatetic examination—if *edict* be desirable—and would not saddle the parent body with those expenses fairly belonging to the Institutes, and at the same time would prevent the valuable time of the examiners—professors settled in London—from being wasted.

It is a great experiment, worth being fully tried, but not at the cost of swamping all the objects for which the Society was originally formed. But I believe that one result will be much cram; and I hold it far more important to put before the great mass of the community the means of studious acquisition—which the facultied individuals may absorb—for they cannot be taught. They can only learn, thus, to exhibit a large quantity of forced or hothouse acquirement on an examination platform. "By the hammer of Thor" we are a nation as noble as exists on this round world. How much better we may be made by examinations I know not, but the widely-spread system of continental examinations has, up to this time, failed in making any continental nation as great as ourselves in arts, manufactures, or commerce. We have, withal, preserved our freedom to do still more, and I feel convinced that if examinations are to be made really useful, it must be by some system in which patronage is not a main element. The putting half-advised state appointments at the disposal of the Society by influential members, has no soundness in it. I will return to this subject at a future time.

I am, &c.,

W. BRIDGES ADAMS.

1, Adam-street, Adelphi, December 25, 1857.

THE BYE-LAWS OF THE SOCIETY OF ARTS.

SIR,—At the recent Special General Meeting of the Society of Arts, great stress was laid by the Council on the illegality of the Bye-laws relating to the Board of Examiners, which the members were then called upon to revoke, but the question how and when the said illegal Bye-laws came to be adopted, was left unanswered. It is desirable, therefore, that the members should be put in possession of facts which show in how loose and careless a manner some, at least, of the business of the Society has, hitherto, been transacted, and prove that the Bye-laws generally require revision.

As to the mode in which the Bye-laws in question, and several others, were framed by the Council, I, together with every other member of the Society not on the Council, must remain ignorant, but that they were adopted at a Special General Meeting (?) of the Society, held on Thursday, the 19th February, 1857, the *Journal* of the Society (No. 223), without referring to the min-

utes, is sufficient evidence. This Special General Meeting, I presume, was legally convened by the proper authorities, but how came it that no notice was given in the Society's *Journal* that such a meeting was to be held? It is true that one advertisement was inserted, on the previous Friday, in the advertising pages that form the wrapper of the *Journal*, but as these pages form no part of the *Journal* itself, the spirit, if not the letter, of the Bye-laws was in this particular evaded. But now comes the important question. Of how many members was this Special General Meeting composed. Five members only, besides the Chairman and Dr. Booth, were present, but when the Bye-laws relating to the Board of Examiners, and others of equal import, were adopted, even those five members were not all present. Would this number in any other Society have constituted a legal meeting? The Bye-laws of the Society of Arts, however, admit any number of its members, few as it may be, to constitute a General Meeting, since (will it be credited?) they omit to fix the number that shall form a *quorum*. The Society of Arts, I believe, numbers above two thousand members; the Council, including the president and vice-presidents, numbers thirty-four. The Bye-laws enact that "at all meetings of the Council three shall be a quorum, except when otherwise directed by the Bye-laws," but, for a General Meeting of the Society, it appears that even two members, in addition to the chairman, are deemed sufficient to form a quorum.

The Bye-laws relating to the Board of Examiners were not the only Bye-laws adopted at the meeting in February last. Chapter XV, containing nine clauses relative to the "*Union of Colonial, Scientific, and Literary Institutions*," and Chapter XVI, containing four clauses relating to "*Honorary Local Secretaries*," were then made and adopted. Other minor alterations in the Bye-laws were also made, and some of greater importance proposed by the chairman—the latter, however, were negatived by the meeting. The few members present were apparently opposed to the views of the Chairman, and how those Bye-laws, which the members were lately called upon to revoke, were then adopted, I cannot imagine. Are we, to quote the words of Mr. Cole the other evening, to suppose there was some *hocus-pocus* work? But mark the confusion into which the whole of the Bye-laws have been thrown by the transactions of this "hole and corner" meeting. By what authority have the numbers of the various chapters and sections of the Bye-laws been altered? Let any member refer to the printed copy of the Bye-laws, bearing date Oct. 19, 1855 (reprinted November, 1856), and that of Feb. 19, 1857; would it be incorrect to assert that all the Bye-laws comprehended in the seven chapters following Chapter XI. have thus, by the unauthorised alteration of the numbers of the various chapters and sections, been rendered illegal? These seven chapters embrace forty-five out of one hundred and six sections which compose the Bye-laws of the Society of Arts.

One fundamental error appears to have been committed in the original framing of the Bye-laws of the Society of Arts. Instead of a division of the several headings and chapters, and a subdivision of these chapters and sections, so that any particular clause could readily be referred to as chapter—th, section—th, the numbering of the various sections has been carried on from first to last without subdivision. What has been the consequence? Whenever it has been found expedient to revoke or amend any of the Bye-laws, or to adopt new ones, the introduction or omission of any clause has thrown all the others into confusion, and necessitated the alteration of the number of every successive section or clause. The number of the chapter or section of any Bye-law cannot legally be altered without the consent of a general meeting, since it forms an essential part and parcel of the Bye-law itself—in fact, the index.

The present Council have wisely taken the obvious in their power to obviate the dilemma in which

have become involved by the proceedings of the so-called "Special General Meeting" of February last; but much remains to be done. The expediency of having a larger number of working members on the Council must be considered. Nothing can more forcibly exhibit the disadvantage of intrusting the affairs of so large a Society in the hands of a few than the facts above mentioned,—when it is in the power of the Chairman of the Council, aided by two or three members, to make any alterations they may please in the Bye-laws of the Society.

I am, &c.,

J. B. S.

December 5th, 1867.

DRAIN PIPE MACHINERY.

SIR,—This machinery, now in such general use, is identical in all its details, with the exception of magnitude, with that which has been in use for some centuries in all the macaroni districts of Italy, that is to say, from Genoa to Naples inclusive.

It is, moreover, a fact, that about the year 1820, Italian machinery for the manufacture of macaroni, was set up and in use in Cromer-street, London, by C. W. Fletcher, the late Lord Byron's valet, in conjunction with two Italians. Priority of claim, therefore, for this invention can scarcely be claimed by any Englishman of the present day.

The double edgestones used for crushing raw and burnt clay, have always been used by the Italians for grinding or crushing various materials, as well as for kneading the macaroni dough, but they have a different mode of setting them to work from what is usual in this country. They always mount them so as to lean outwards at a considerable angle, a position which, combined with the necessary conical bevilled edge, gives them double the grinding power that is obtained by the vertical-edge stones, with cylindrical edges, which would only roll on in a straight line if left to themselves, while these would revolve in a circle of contrary curvature.—I am, &c.,

HENRY W. REVELEY.

COAL AND COKE.

SIR,—I was much gratified with the review of my letter on this subject by Mr. C. W. Williams, and only regret that I incautiously included that gentleman in the general category of patentees of smoke-preventing inventions, believing, as I did at the time, that Mr. Williams held a patent of some kind for that purpose. I also regret that Mr. Williams has had occasion to complain of my observations on the Prize Essay as regards the subject of ash-pits, which is passed over in the Essay with a very few words, and, on looking over Mr. Williams's diagrams, it is evident that the ash-pits are all, without exception, on the old plan, without any improvement whatever being suggested or indicated, not even the simple but very effective plan of causing the fresh air to rush in from the farther end of the boiler, closing the front opening of the ash-pit with an air-tight door, and reversing the slope of the fire bars. Certainly, no allusion to the possible defects of existing ash-pits, or improvements thereon, was made by any of the speakers at the reading of Mr. Apley Pellatt's paper on the "Comparative Heating Powers of Coal and Coke."

I freely admit that my observations will scarcely apply to marine engines, which, in regard to confined boiler-room and miserable ash-pits, are in a very bad case. But I should hope that talent and genius may some day devise a less clumsy mode of propulsion than steam and coals, which together occupy more than half the vessel, and are very far from being pleasant companions at sea. It has been found that some steamers were inveterate consequence of the want of free access to the atmosphere. I do not uphold the preposterous arrangement for general use, but contend that in

the common run of land engines there is not sufficient heating surface exposed to the fire to carry on evaporation with the greatest economy; and that the table of combustion and evaporation, inserted in Mr. Williams's letter, goes far to corroborate my assertion that where space is no object, as in land engines, slow combustion is more economical than quick, inasmuch as by the test applied, it appears that under a system of slow combustion one pound of coal evaporates 9.56, while, with hard firing, one pound of coal will only evaporate 9.48. I daily witness the awful destruction of furnaces and fire-bricks in all the land engines round this locality, with the exception of one—a 16-horse power, with a 25-horse boiler, which, though badly set up, works easily with sawdust, mixed with a small proportion of coal dust or waste cinders.

I cannot conclude without sincerely thanking Mr. C. W. Williams for the very kind manner in which that gentleman has noticed my crude observations, and with the hope that all discussion tends to progress,

I remain, &c.,

HENRY W. REVELEY,
Surveyor of Steam-boat Machinery under the
Board of Trade.

Poole, Dec. 28th.

MR. UNDERWOOD'S PAPER ON INK.

SIR,—As Mr. Underwood, in his paper on the "History and Chemistry of Writing Ink, &c.," read before the Society on the 16th December, did not mention that we are indebted to M. Runge for the invention of a writing ink made with chromate of potash and decoction of logwood, which combination appears to be the novelty in the ink introduced to the notice of the meeting, I trust that in supplying the omission, I shall not be trespassing on the pages of your *Journal*; and I send you for insertion M. Runge's receipt, copied from the *Chemical Gazette* for 1849, page 108.

"A most excellent ink for steel pens is obtained by exhausting ten parts of logwood with a sufficient quantity of boiling water to obtain 80 parts of liquid. To one thousand parts of this decoction is now gradually added one part of yellow chromate of potash, when the liquid turns first reddish-brown and finally bluish-black. No gum or any other addition is requisite; on the contrary, they are injurious. This liquid is an actual solution, which may be filtered. No deposit is formed in it, and the writing is not removed by immersing the paper in water. Digler's Polyt. Journal, c. ix, page 227."

I am, &c.,

B. WINSTONE.

SIR,—In the report of the discussion which took place after the reading of Mr. Underwood's paper, the reporter has misunderstood the purport of what I stated.

The observations I made applied to the ferro-prussian, and not to the indigo blue, as he represents. It is very unfortunate that these two colours, so different in their chemical constituents, should always get confounded in the public mind, as is evidenced by the observations of Mr. Pearsall, reported in your *Journal*, who says that, having found that blue ink was obliterated from the accidental spilling of water over a sheet written upon with it, it had determined him against using it in future. It is in this way that prejudices are created and perpetuated, for if Mr. Pearsall had ascertained what sort of blue ink he had been using, he would have found that it was indigo, and not prussian blue, as he imagined. The one indigo, in the form long used for ruling and private marking, being a very soluble composition, and the other prussian blue, being one of the most fixed and durable colours, the writing from which bears soaking in water, in chlorine, and acids for a number of years, without parting with any of its colouring matters.

Having tested the durability of the solution of prussian

blue, by using it on wood tickets for distinguishing the variations of plants and flowers in gardens, as well as soaking it in solutions of chlorine and acids, I feel desirous to prevent, as far as I can, the perpetuation of prejudices which have no foundation beyond the mistake that is made by confounding the blue colour from indigo with that from prussian blue, and making the latter responsible for all the failings of the former colour.

I drew a sketch of the comparative permanence of the blue ink (prussian blue I mean) and that from the galls and iron, which your reporter has missed in his report. The following is the purport of what I said:—The inherent tendency of iron to pass from the state of a protoxide to that of per-oxide, is the main cause of the destruction of colour in the black ink. The iron in the ink, under the influence of moisture, absorbs oxygen, and gradually destroys the vegetable matter with which it is combined, leaving the writing a sort of iron mould upon the paper, in which state it is seen in old records and in writings that have been exposed to damp. The reverse of this takes place with blue ink made with the ferro-prussiate. The tendency of the iron to absorb oxygen increases the intensity and durability of the blue colour; thus the cause that leads to destruction in the one case, gives increased colour and permanence in the other.

I am, &c.,
HENRY STEPHENS.

54, Stamford-street, Blackfriars road,
Dec. 23, 1857.

AGRICULTURAL IMPLEMENTS.

SIR,—I have read Mr. Waller's letter in your *Journal*, and I am obliged for the information about Meikle's machine, with which I was, as he supposes, like most Englishmen, very imperfectly acquainted; and I shall be happy to accept his offer of a copy of his papers on Agricultural Implements. No doubt they will contain some useful information, and if they also show me how to include a history of mills, an account of all the schemes for ploughing by steam, and the disputed question as to the priority of the invention of the portable farm engine, as well as a list of all the agricultural implement makers from the last Salisbury catalogue, in a paper of an hour, without omitting the elementary information I did contrive to give, I am sure he will teach me what no one else can.

If he will read my paper over again more carefully, he will see that I did give Scotchmen the credit of inventing the threshing machine, the iron swing plough, the horse-hoe (Blaikie), and the reaping-machine (Bell). I still adhere to the statement that the Scotch, having been, for a long series of years, in advance of England in agricultural implements, have, for several years past, lagged behind. The first instance is the Scotch swing-plough, which was probably better than anything made in England twenty-five years ago, but which is now undoubtedly inferior to the iron wheeled-ploughs of our best makers. The superiority of English manure-distributing drills, horse-hoes, clod-crushers, and threshing machines, is attested by the sales effected by our principal makers in Scotland. My theory is, that while all implements of the farm were made on the farm, or in the village, the well-educated Scotch mill-wright or blacksmith had the advantage; but when the factory system was established, English implement makers went a-head. The seed-drill was used in Roxburghshire fifty years before it came into use in England. The Scotch (Finlayson's) drag harrow was much esteemed in England seventeen years ago, now it is superseded by the English, Coleman's, Biddell's, or some of the other factory-made cultivators. I throw out these observations not authoritatively, but rather with the view of eliciting information and discussion, but I should particularly like to know why the Scotch still adhere to the swing plough. In the last edition of Mr. Stephens's Book of the Farm, the only plough mentioned is the swing plough.

The question of prizes for agricultural implements is one which is worth discussing, and fit to be discussed in this journal, in a temperate philosophical style; and when I have leisure I shall be happy to give my mite of information, the result of an examination of the lists of all prizes that have been awarded by the Royal Agricultural Society since its formation, a document which will rather surprise the advocates of the prize system.

I am sorry Mr. Waller does not like hunting, as it does really afford an opportunity for seeing agricultural operations, and ascertaining the progress of thorough drainage, which cannot be obtained by a constitutional ride along the road. The barbarous state of cultivation in the metropolitan counties is a fact which cannot be denied, and which I should like to see explained.

Mr. Waller appears hurt at my unkind remarks on Essex, where, by-the-bye, they are very fond of swing ploughs, while the editor of the *Agricultural Gazette* thinks I ought to have taken more pains to contrast the districts where the best and worst implements are to be found, and I think the latter is right.—I am, &c.,

S. SIDNEY.

Central Farmers' Club, 24th Dec. 1857.

Proceedings of Institutions.

BOLTON.—On Wednesday, the 16th December, a lecture on "Stained Glass Windows," was given by Mr. G. J. French, president of the Mechanics' Institute. The lecturer glanced at the traditional account of the discovery of the formation of glass by certain Eastern merchants, after cooking their victuals on a sea shore. The two materials which, when fused together, formed glass, were fine sand and an alkali or alkaline earth, as potash, soda, or lime. If these were perfectly pure and free from other substances, the result would be a colourless glass, but impurities always mixed with the sand, as iron, copper, or lead, not visible to the eye, but being combined with the substance used, the metal had the effect of colouring the glass; impurities in the alkali had the same effect. The commonest glass, that used for bottles, was of a dull green colour, arising from the presence of iron rust in the sand and dirt in the ashes from which it was made. The white or colourless glass was a most valuable product, to which we were indebted for one of the greatest conveniences of civilisation. To make coloured glass it was requisite to mix in the melting pot some metal with the ingredients before mentioned. The coloured glass thus produced was called pot metal, or pot metal glass, which was blown in circular pieces or tables, similar to common window glass, and sometimes cast in plates. Mr. French exhibited specimens of this glass; the purple or ruby pot, red, yellow, blue, green, violet, and black—and named the ingredients from which they were produced. In different proportions the ingredients produced various tints of colour; they were also altered by the greater or less amount of heat to which they were exposed in the melting pot. A specimen of "ruby flashed" glass was shown, and the operation of forming it described. The lecturer then noticed the mysterious recipes which so recently as 50 years ago used to be published about the modes of making the coloured pot metal; it suited the makers at that time to cover their operations with a shroud of secrecy. Most of the best discoveries in the art had been quite accidental; the ancient red glass was coloured by using gold in the pot, yet it was accidentally discovered, in a German glass-house, that a beautiful red might be procured from copper, and this was now done. Much stained glass had been imported into England during the last fifteen years, mostly from Munich, where it was largely manufactured. The colours were always very dark, with a great preponderance of blue. This glass was by no means pleasing, at a very low station in art; but it had been ra

purchased, for no other reason than the depth and fullness of its colour. It must not be confounded with glass made at the Royal Factory of Munich, very little of which reached this country; it was of the very highest excellence in art, and differed in every respect from the manufactured glass described. The existing mode of blowing ruby glass was very old, perhaps as old as the introduction of any glass into this country, which is said to have been in the year 647; though there was little of it used in England for a long time after that period. Other colours could be treated in the same way as the ruby; such was the case with blue, but this was not done until the beginning of the 16th century, about the time that Henry the 8th came to the throne. The beautiful purple glass and its modes of production were next described. It was often said that the modern glass painters could not produce the rich ruby colour of the ancient masters; this was a mistake; there was no difficulty in its production at the present day—but the cost of the powder (a compound containing much gold) by which it was produced, caused the moderns to use less expensive materials, except for first-rate work. With reference to the term “stained glass,” it must be remembered that the only stain that could be given to glass was a yellow one, that was the only colour which could be applied to glass as a stain upon its surface, for the colour in the pot metal and the flashed glass entered into actual combination with the melted materials. The production of the yellow stain was then described, and specimens shown. This yellow stain was unknown before the beginning of the 14th century, about the time of Edward I., and had ever since been much used in preference to the yellow pot metal. It possessed this great advantage, that while all other colours were diffused over the entire piece of pot metal glass, yellow could be applied partially. White glass might be ornamented with a yellow device; a yellow stain applied to each side of white glass produced a very rich colour; it might be applied to blue flashed glass, making it green, or to ruby, which it turned into a bright scarlet. Thus the yellow stain added greatly to the resources of the ancient glass painters. The lecturer then dwelt for a short time upon the materials which the glass painter does not or should not employ. The most imperishable materials should be used. Oil paint or varnish, even in small quantities, would prove at length a cheat and a delusion. He had more than once detected this fraud in expensive windows. Having described the materials for making a window, he asked their attention to a brief history of the art, the mode of executing the work, and the tools employed at various times. He would begin with what was called the Norman style of church architecture, commencing about the year 1066, and which continued until the year 1,200, a period of 134 years. The walls were remarkably thick and deeply splayed inside, and the windows very small and narrow, with rounded tops. The obvious intention of this arrangement was to admit as much light and to exclude as much bad weather as possible, and the inference to be drawn from this arrangement was that no glass whatever was used in such a window. The height also served to protect the people from wind and rain. Very little light could be supplied by these windows. The chancel, where the services were read, was usually better lighted with three windows of the same kind placed close together. Long before this time, however, glass windows had been occasionally used in churches, but no vestige of any glass of the Norman period had been discovered. With the early English style, which succeeded the Norman about 1200, and remained in fashion about 80 years, much more light was let into the church; the windows were longer and larger, often placed two, three, or five together, always with pointed tops, like a surgeon's lancet, hence called lancet-shaped windows. The early English was succeeded by what was called the decorated style of Gothic. The opening of the window was now much larger than before, and the head was

often beautifully filled in with flowing and geometrical tracery. This style prevailed from 1280 to 1380 just one hundred years, when the first three Edwards reigned. The last style of Gothic architecture was called the perpendicular, because the principal mullions in the window instead of diverging when they arrived at the spring of the arch, as in the decorated, ran straight up to the top though delicate tracery was introduced between them. The perpendicular style lasted from 1380 to 1530, or from the time of King Richard II. to Henry VIII. inclusive. No glass of the earliest or Norman style had been found in this country. It was probable that ordinary churches had none. Of the early English style, many examples remained. During the early English period a great change took place in the style of glass painting: white glass of a beautifully translucent but not transparent kind, was largely employed; this was arranged in graceful patterns, the lead work flowing in finely curved lines, a very slight proportion of coloured glass being introduced in small medallions and other graceful forms. The finest example of this kind of glass which he had ever met with was in the windows called the Five Sisters, in York Minster. The lecturer then exhibited some fine specimens of old glass of the period treated of. The specimens were proved to be above 500 years old by the absence of the yellow stain. He also exhibited some ancient specimens of French painted glass, proved to be before the time of our Edward III. The process of producing these was minutely pointed out. Mr. French then gave an elaborate description, aided by a coloured engraving, of the great east window of York Minster. John Thornton, of Coventry, contracted with the dean and chapter of York to glaze the window in the space of three years, drawing the figures and ornaments and painting the glass himself. The materials and such assistants as he required were provided by the dean and chapter, who also agreed to pay him as wages every week 4s., at the end of each of the three years £5, and after the work was completed £10 more for his reward. The windows of St. Stephen's Chapel, Westminster, were executed under the charge of one John de Chester; that is of an artist named John, a native of Chester. He had 7s. a week for wages, and employed other workmen a 6d. a day, among whom was a John de Coventry, probably the father or grandfather of that John Thornton of Coventry, who, fifty years afterwards, commenced the York window. The ancient process was quaintly pointed out, and the tools of the old workmen described. The crocyer, or cross iron, was one of the tools, and John de Chester was in the habit of paying to Simon le Smyth 1½d. each for them, “and bought as many as severall at a time.” Now and then events of local historical interest were found recorded in stained glass, and where such had been preserved they were always of great value. Mr. French here showed an accurate coloured tracing of glass now in the Parish Church of Middleton, the adjoining parish to Bolton. He believed the glass was not originally placed there, but was long ago removed to the church from an old hall in the neighbourhood. It represented a priest and 16 archers kneeling in church, and saying a prayer of thanksgiving for their safe return from the bloody battle of Flodden Field, to which they were led, under the command of Edward Stanley, in the year 1513. Each archer carried his bow over his shoulder, his quiver of arrows at his side, and had his name inscribed over his head. Most of the names were represented by families still resident in and about Middleton. The sometimes, great difficulty of supporting the large painted windows, and yet shading the iron and leads required, was next pointed out and examples given. For the production of a work of high art in stained glass a combination of qualifications was required. Supposing that the artist was at liberty to choose his own subject, he should so treat it as to harmonise with the sacred character as well as the architectural decoration of the building in which it was to be placed; there should be

solemn repose in the figures, and, as far as possible, no appearance of action. The colours also should please by their harmonious arrangement, rather than surprise and startle by brilliancy of contrast. There were great difficulties in the way of high art in stained glass, though he hoped they were gradually giving way before increasing demand and greater skill. Heraldic subjects were largely used in painted glass. Mr. French then exhibited numerous specimens of old coloured glass, explaining the curious devices with which some of them were ornamented. He then referred to some of the modern improvements introduced into the manufacture, observing that the invention of moulding had been applied in many ways for the purpose of adorning windows, as in a specimen which he exhibited, where the centre was a rich Lancashire rose, which was not cast, as might at first be supposed, from ruby glass. The rose was white glass, but there was placed over it a very thinly blown plate of ruby, which imparted the colour to it; had the rose been cast in ruby glass, it would, from its thickness, show almost black. The three-light window over the communion-table in Christ Church, Bolton-moor, was for the most part filled with moulded glass, and was well worth attention. There could be no doubt that the modern artist and manufacturer would be enabled to introduce numerous effects from the employment of cut crystal and moulded glass far surpassing in gorgeous splendour the utmost efforts of the old masters. At the conclusion of the lecture a vote of thanks was warmly and unanimously accorded to Mr. French.

ROYSTON.—On Thursday, 17th December, Dr. J. C. Daniel delivered a lecture at the Institute, on "The Life and Times of Sir Walter Raleigh."

SLOUGH.—The report of the Mechanics' Literary and Scientific Institution, for the year ending Michaelmas, 1857, speaks of the satisfactory state of the financial department of the Institution. The accounts show a total of receipts from the annual subscriptions of the members and from other sources, amounting to the sum of £150 7s. 11½d., of which no less than £26 1s. 3d. is referable to the fête held in Stoke-park in July last. The whole expenditure for the same period reaches the sum of £141 5s. 3d., which includes £30 laid out in the purchase of books for the library, &c. The Institution at the present time comprises 194 members, and its resources have steadily increased, both in the number of its members, and the amount of its revenue. No less than 140 volumes have been added to the library during the past year. The committee report the continuance and progress of the drawing classes, under the kind and gratuitous superintendence of James Chapman, Esq., assisted by Mr. George Dorrell. Last March five of the members went up to the School of Design, at Kensington Gore, for examination, three of whom obtained prizes. Mr. Chapman is preparing some more of the members for the examination, which will again take place about next March. Early in January the course of practical geometry will re-commence. The committee have much cause for congratulation in directing attention to the drawing class, which forms so important a character in the Institution, and which is so rarely to be found in connection with Institutions of this kind; and the committee gratefully offer their sincere and hearty thanks to James Chapman, Esq., for his great kindness in imparting gratuitously such important benefits to a class who could not otherwise have the opportunity of acquiring so useful a branch of knowledge. The Hon. Secretary, Mr. G. Kershaw, voluntarily conducts a singing class upon the Hullah system. The Institution has this year been admitted into union with the "Bucks and Berks Lecturers' Association," several of whose members will deliver lectures this season. Towards the conclusion of the session of last year, a suggestion was thrown out that in addition to the lectures and other sources of instruction, public readings would materially tend to the edification and improvement of the members, and the committee

are happy to announce that they are now engaged in an endeavour to put this suggestion into practice.

MEETINGS FOR THE ENSUING WEEK.

- MON. Entomological, 8.
TUES. Pathological, 8. Anniversary.
 Photographic, 8.
WED. Geological, 8. I. Dr. C. Daubeny, "On the Emanation of Ammonia from Volcanoes." II. Prof. Huxley, "On Pteraspis, a palaeozoic genus of Fish." III. Prof. Huxley, "On a new species of Plesiosaurus."
 Pharmaceutical, 8.
 Royal Soc. Lit., 8½.
THURS. Zoological, 3.
 Royal Society Club, 6.
 Philological, 8.
 Royal, 8½.
FRI. Astronomical, 8.
SAT. Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Dec. 25, 1857.]

Dated 20th August, 1857.

2213. George Spill, Stepney green—Improvements in treating fabrics employed in the manufacture of hats, caps, and bonnets, and for other purposes, and also other fabrics, so as to render the same impervious to moisture and grease.

Dated 19th October, 1857.

2668. Marcellin François Cavalerie, 39, Rue de l'Echiquier, Paris—Improvements in obtaining motive power, and in the apparatus connected therewith.

Dated 21st October, 1857.

2887. John B. Slawson, New Orleans, U.S.—An improvement in boxes for receiving the fares of passengers in public conveyances, for the prevention of fraud on the part of the persons authorised to stand to the receiving of the fares as well as on the part of the passengers. (A communication.)

Dated 24th November, 1857.

3935. Emmanuel Octave Bordes, 36, Bond-street—An improvement in billiard cues. (A communication.)

Dated 27th November, 1857.

2968. Samuel Barlow Wright and Henry Thomas Green, Rugby—Improvements in apparatus used in the manufacture of bricks, pipes, and tiles.

Dated 28th November, 1857.

2962. Jules Peters, Eupen, Prussia—Certain improvements in the machinery used in spinning.

Dated 1st December, 1857.

2966. Thomas Jefferson Thompson, Greenwood-park, Newry, Down, Ireland—Improvements in apparatus for lighting railway trains with gas.

Dated 7th December, 1857.

3028. James Stiff, London Pottery, High-street, Lambeth—Improvements in drain pipes.

3029. George C. Greenwell and William Selby, Radstock—An improved machine for washing coals and other minerals, and for separating them from other substances.

3030. James Harris, Hanwell, Middlesex—Improvements in signalling, and in apparatuses employed therein, part of which is applicable to the compression and exhaustion of air and other fluids.

3031. Robert Reeves and John Reeves, Bratton, near Westbury, Wilts—Improvements in implements for depositing seed and manure.

Dated 8th December, 1857.

3032. George Holcroft, Manchester, and George Denholm, Wigan—Certain improvements in steam engines.

3033. Benjamin Shaw, Wellington, Salop—An improvement or improvements in the construction of windows.

3034. Henry Perbouse, Birmingham—An improvement or improvements in stereoscopes.

3035. Edmund Outram, Leeds—An improved steam regulator.

3036. Charles Nightingale, Wardour-street, Soho—Improvements in machinery for feeding hair and fibres intended to be spun or twisted.

3037. Henry Dolman, Nelson-street, Greenwich—An improved stand for "cheval" and other "dressing" glasses.

3039. William Edward Newton, 66, Chancery-lane—Certain improvements in obtaining motive power. (A communication.)

3040. William Rowan, Belfast—Improvements in spinning flax and other fibrous material, in preparing the same for weaving, and in the machinery employed therein.

3041. Richard Archibald Brooman, 166, Fleet street—Improvements in cocks and valves for regulating the flow of fluids. (A communication.)

3042. Thomas William Willett, 89, Chancery-lane—Improvements in the manufacture of gunpowder and in the machine connected therewith.

Dated 9th December, 1887.

3043. Charles De Borge, 9, Downgate-hill—An improved mode or modes of blowing, feeding, or introducing air into furnaces or other fire-places.

3044. Samuel Clark, 65, Albany-street, Regent's-park—An improvement in wheels for candles and night lamps.

3045. Joseph Smith, Walsall, Walsfordshire—Certain improvements in securing rails in their respective chairs for railroad permanent ways.

3046. John Haddon, Glover-street Works, Birmingham—Certain improvements in the manufacture of wood screws, a portion of which is also applicable in the manufacturing of certain descriptions of nails.

3047. William Kiddle, 4, Stonefield-terrace, Liverpool-road—Improvements in steam engines.

Dated 10th December, 1887.

3048. James Hoddell, Northampton-square, Clerkenwell—An improvement in watches.

3049. Guillaume Ther-Katz, Paris—An improved registering and controlling apparatus for hackney-coach and other public carriages.

3050. Isaac Arrowsmith Best, Saint Paul's-square, Birmingham—A new or improved mode of manufacturing printing types.

3051. Samuel Biggins and Joshua Biggins, Sheffield—Improvements in the construction of the handles of tea and coffee-pots, and other similar articles.

Dated 11th December, 1887.

3052. John Chadwick, Manchester, and Arthur Elliott, West Houghton, Lancashire—Improvements in machinery for spinning, doubling, and throwing silk.

3053. Joseph Tanton, Frederick-street, Caledonian-road—Improvements in shepherd's crooks.

3054. John Strather, Hull—Improvements in producing surfaces in imitation of wood for printing from.

3055. William Denne, County Lunatic Asylum, Bedford—Improvements in apparatus used for lifting patients off beds and other surfaces used for reclining upon.

3056. Nathaniel Richard Hall, Northfleet—An apparatus for registering the phases and age of the moon.

3057. Julius Roberts, St. Leonard's Iron Works, Poplar, and Miles Beale, Surrey-street, Strand—Improved machinery for obtaining and applying motive power, applicable chiefly to the working of ships' pumps, and other mechanism on ship board.

Dated 12th December, 1887.

3058. James Parker, 4, Grove-terrace, Grove-road, Forest-vale, Sydenham—A novel application of steam power for the movement of vessels or other bodies floating on or suspended in water, air, or other fluid, and for moving machinery, and propelling solid bodies on land.

3059. Frederick Walton, Houghton Dale Mills, near Manchester—Improvements in the manufacture of rollers used in machinery for preparing and spinning fibrous materials, and for other purposes where elastic pressure is required, also in the machinery employed in the manufacture of the said rollers.

3060. Francis Pals, Haverstock-hill—A new combination of mineral substances for the production of artificial stone.

3061. William Cren, Redruth, Cornwall—Improvements in machinery for cleaning and dressing minerals.

3062. John de Normann, Naples, and William Thomas Henley, St. John-street-road, London—Improvements in machinery for preventing the overlapping of chains or ropes when used on drums or shafts, which improvements can be applied to the laying of telegraphic cables.

3063. Charles Cowper, 28, Southampton buildings, Chancery-lane—Improvements in photography. (A communication.)

3064. Jean Marie Prioulet, 53, Chancery-lane—An improved engine with rotary piston, applicable to various purposes. (A communication.)

3065. Henry Duncan Preston Cunningham, Bury—Improvements in winding and twisting mills.

Dated 14th December, 1887.

3066. Julius Kellfield, Houghton, Lancashire—Improvements in machinery or apparatus for cutting and separating fur, or hair, or wool, from skins or skins, which said improvements are applicable to cutting vegetable or fibrous materials.

3067. Thomas Brundage, Manchester—Improved apparatus for obtaining and applying motive power.

3068. Jean Pierre Bruggem, 20, Rue de l'Ecliquier, Paris—Certain improvements in drying.

3069. William Liddle, Queen's-road, Regent's-park—Improvements in lamps.

3070. Joseph Parker, Liverpool—Certain improvements in the construction of motor-cars.

3071. Adam Smith, Thimble-street, near Liverpool—Improvements in regarding the supply of water and other fluids for domestic and other purposes.

Dated 15th December, 1887.

3072. James Hagg, junr., 14, St. Andrew-square, Edinburgh—An improvement in the manufacture of "copying-paper."

3073. William Smith, 14, Salisbury-street, Adelphi—Improvements in chromotypographical printing process. (A communication.)

3074. Edgar Bradfield, 6, King William-street, City—Improvements in the manufacture of glass bottles.

3075. John Bradfield, Bradfield—Improvements in ovens applicable for baking bread and pastry, roasting or cooking meats, and similar purposes.

3076. James Chadwick, Cockburn Print Works, near Rochdale—Improvements in rollers or cylinders for printing or staining the surfaces of woven fabrics, yarns, paper, and other materials.

3077. Edwin Turner, Bradford, Yorkshire, and John Charles Pearce, Bowling, near Bradford—Improvements in the manufacture of railway wheels.

3078. Francis Redwell, Redwell-hill, Bath—Improved means of communicating between the passengers and guard, and the guard and engine-driver, upon railways.

3079. George Tomlinson Bondfield, Longborough park, Brixton—Improvements in the manufacture of cast steel. (A communication.)

3080. William Galloway and John Galloway, Manchester—Improvements in hydraulic presses.

3081. Thomas Howard, the King and Queen's Iron Works, Rotherhithe—Improvements in machinery or apparatus for rolling iron bars used in the construction of suspension bridges and otherwise.

3082. George Allen Everitt, Birmingham—Improvements in the manufacture of tubes or cylinders of copper or alloys of copper.

Dated 16th December, 1887.

3083. James Green Gibson, Chesham, Manchester, and Samuel Berrisford, Stockport, Cheshire—Improvements in looms for weaving, parts of which improvements are applicable to lubricating bearings generally.

3084. John Mariand, Farnley Vale, near Upper Mill, Saddleworth, Yorkshire—Improvements in apparatus to facilitate the placing of cop tubes on to spindles.

3085. Edwin Hillier Wansell, Titchfield, Southampton—Improvements in the manufacture of white lead, and in the working up of the waste materials.

3086. James Hill Dickson, Stanley-terrace, Rotherhithe—Improvements in machinery or apparatus for stretching and hackling flax, hemp, and other similar fibrous materials.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

3100. John Everard Barton, Kidderminster—An improvement in winding worsted on to the creel bobbins of carpet looms. 17th December, 1887.

3103. James Broad, 149 and 150, Drury-lane—The construction of pressure or fountain lamp, to burn with safety from ignition in the overflow, and from explosion, all bituminous, carbonaceous, and resinous oils, spirits and naphthas, or admixtures thereof, also the products of Rangoon earth oil, petroleum, also to adapt all pressure and fountain lamps burn these substances which are found to ignite in the overflow and cause explosion, &c., in all such lamps as at present constructed.—17th December, 1887.

3111. Samuel Darling, State of Maine, U.S.—An improved pen sharpener. (Partly a communication.)—18th December, 1887.

3112. Charles Winslow, State of Massachusetts, U.S.—An improvement in the manufacture of "elastic gore cloth."—18th December, 1887.

WEEKLY LIST OF PATENTS SEALED.

<i>December 23rd.</i>	1824. John Talbot Pitman.
1814. Narcisse Laurent.	1828. Isidore Charles Cloet.
1817. Juan Patillon.	1837. William Parsons.
1818. James Lawrence.	1838. Joseph Alsop and Edwin Fairburn.
1821. John Lyon Field and Chas. Humphrey, junr.	

PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID.

<i>December 21st.</i>	<i>December 24th.</i>
2741. John Gray.	5. Stephen Giles.
2742. Gerd Jacob Benson.	6. Henri Louis Dormey.
<i>December 23rd.</i>	
2724. F.S. Thomas & W.E. Tilley.	

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. of Design.	Date of Registration.	Title.	Proprietor's Name.	Address.
4088	Dec. 24.	The Tourist's or Expanding Collar	{ Joseph James Welch & John Stewart Margaretson	Chesham.
4077	" 25.	Anti-convulsive Inhalant	George Dawber	Birmingham.
4014	" 26.	Twisting Thread for Figs and other Animals	David Prosser	Harescomb, Gloucestershire.
4089	" 27.	The London Street Fence	Deat, Alcock, and Co.	Wood-street, Chesham, E.C.

Journal of the Society of Arts.

FRIDAY, JANUARY 8, 1858.

COUNCIL.

The following gentlemen have been unanimously chosen to fill the vacancies in the Council:

Thomas Dyke Acland.
Dr. Thomas King Chambers.
Thomas Sopwith, F.R.S.
Sir Thomas Phillips.

EXAMINATIONS.—NOTICE TO INSTITUTIONS.

No person who shall not have been for three months previously a member of, or student of, a class in an Institution in union with this Society, can be admitted to the Final Examinations. Moreover, to bring the Examinations within reach of the Members of *Incipient* Institutes and small Evening Classes for Adult Instruction, which cannot afford to pay two guineas for union with the Society of Arts, any Provincial Union or Association, or Local Board for the promotion of Adult Instruction, may unite with itself any number of such incipient Institutions and Small Evening Classes in its district, and give to the whole of them, but *not to fully developed Institutes*, the privileges of Union with the Society of Arts in respect of the Examinations, for a single annual payment of Two Guineas.

EXAMINATIONS AND LOCAL BOARDS.

The following letter has been received from the Mayor of Sheffield:—

"Sheffield, 31st December, 1857.

"Sir,—I beg to refer you to my last, of the 22nd instant, and have now the pleasure to hand you a report of the proceedings of the meeting therein mentioned, and remain,

"Sir, yours obediently,

"ROBERT JACKSON (Mayor)."

THE MAYOR'S ROOM, COUNCIL HALL, SHEFFIELD,
26TH DECEMBER, 1857.

At a meeting of the Educational Institutions (called by the Mayor), and held on Saturday evening, the 26th December, 1857. Present: His Worship the Mayor (in the chair), and deputations from the Church of England Educational Institute, the Working Men's College, the Mechanics' Institute, and the People's College.

It was unanimously resolved, "That two Members of each of the Institutions connected with the Society of Arts in Sheffield form themselves into a joint Committee to carry out the Examinations proposed by the Council of the Society of Arts."

It was further resolved, "That a copy of the above resolution be sent to each of the Institutions here represented."

A vote of thanks was also passed to the Mayor, for his kindness in calling and presiding at this meeting.

COPYRIGHT IN FINE ART.

The following letter has been circulated by the Committee:—

"Society of Arts, Manufactures, and Commerce,
"Adelphi, London, W.C.,
"2nd January, 1858.

"Sir,—A Committee, consisting of the gentlemen whose names are given on the other side,* has been formed by this Society, for the purpose of considering and reporting on the state of the law relating to copyright in works of Fine Art, with a view to obtaining an amendment of it, and I am instructed to lay before you the following resolution, which has been passed:—

"Resolved—That the inquiries of this Committee be directed—

"1st. To ascertain the existing laws of British artistic copyright, and the chief defects of those laws.

"2nd. How those defects affect the interests of producers of works of Art.

"3rd. How they affect the interests of purchasers of works of modern Art.

"4th. How they affect the interests of the public and the promotion of the Fine Arts.

"5th. How they affect the subjects of those Foreign States with whom Her Majesty has entered into international copyright conventions; and what the laws of those States are as affecting artistic copyright.

"6th. To obtain instances of fraudulent or wrongful acts relating to works of modern Art.

"7th. And lastly, to suggest such remedies as appear best calculated to amend the defects of our artistic copyright laws.

"The Committee direct me to call your attention specially to No. 6, in the hope that they may be favoured with the details of such instances as have come within your own experience. The Committee will be glad to receive full and distinct answers on this point. The other points are made known to you solely with a view of showing to what objects the Committee are directing their attention.

"In any instances which you may be able to send to the Committee, the names of individuals may be omitted, if so desired.

"I am, Sir,

"Your obedient servant,

"P. LE NEVE FOSTER,

"Secretary."

THE SEWAGE OF LONDON.

By HENRY ALLNUTT.

"It is impossible for any man with the slightest faith in human contrivance to believe that sewage, containing products that are annually worth not less than £1,000,000 sterling, are ultimately destined to be wasted, while the works we construct for the purpose of throwing it away are a 50 years' debt on the metropolis of a people whose mechanical genius is as remarkable as their wealth is unlimited."—*The Times*, Nov. 17, 1857.

In the *Times* report of the meeting of the Metropolitan Board of Works, on the 23rd November last, Mr. John Leslie (one of the members), alluding to the fact, "that in the proposed scheme for the drainage of London, every one of the sewers would have storm overflows to convey heavy rain-falls to the Thames," said, that this of itself opened the whole question which the Board would sooner or later have to act upon, viz., the separation of the sewage from the rain-fall.

Having carefully examined the Report and Appendix of the Metropolitan Drainage, since the printing of my paper,† dated the 12th November last, I feel convinced that it is perfectly impossible the London sewage can be

* The list of names was published in last week's *Journal* p. 91.

† See present volume, p. 44.

self evident truth, that when anything new of real worth presents itself to the world, it matters not what has been employed before it was discovered, the improvement will be sought for, and its general adoption will be irresistible. Again, it cannot be assumed that the whole of the cesspools have even now been converted into water-closets. At the meeting of the Society of Arts, March 1855, (before alluded to in the *Journal*, page 323, vol. iii.,) Mr. Bazalgette said "that at that time 100,000 houses, or one-third of the whole number in London, had been drained into the sewers, and that the conversion from cesspool to water-closets was going forward at the rate of 20,000 per annum;" if in March, 1855, the total number of houses in London was 300,000, and 100,000 had then been completed, from that time to the present (three years) add 60,000; total, 160,000, no less than 140,000 houses have yet to be accommodated in this way; nearly half of London it seems is still without water-closets; if this is a fact, who can assert that it is too late to rectify the error.

That which specially perplexes, and is so objectionable in the present schemes for the drainage of London, is that the ratepayers are called on to pay for works of sufficient magnitude to suit the requirement of London when it becomes double the size, or even much beyond this area. Now in the method or plan which I and many others advocate, we should only have to provide for the present area—the present wants of the metropolis; we should only have to remove the offensive excrement of the inhabitants as far as it is now produced; true, it will be a troublesome work, but at all events we should only deal with the nuisance of the area now occupied by London, and not its prospective area.

Mr. Haywood remarked (page 319, vol. iii., *Society of Arts Journal*.) in reference to Mr. Ward's observations, "that most people would desire the dispolluting the large surface water sewers which were formerly, and still are, small tributary streams, so that they might still discharge into the river Thames, and collecting the sewage by other channels, and discharging it wherever it was desired; but, in the metropolis, he feared it could not be accomplished, the scheme involved double sets of sewers and house drains. There were now about 1,000 miles of sewers in London, and 100,000 houses draining into them; the first thing to be done would be to lay 1,000 miles of other sewers, by the side of those already existing, and 100,000 additional house drains in the houses already having drains."

It is well known that the present main sewers are not by any means judiciously laid out, that they have, in a great measure, been constructed piece by piece, as building progressed, without any regular plan; this can be seen by referring to plate 4, Appendix 3 (Report). Mr. Haywood, I believe, is not correct in saying that the new sewers and pipes from the water-closets "will have to run side by side with the existing sewers," for the new sewers should be laid out regularly, according to a systematic plan, which should be prepared or drawn up with due regard to the levels and fall to the locality to which you desire to conduct the sewage, with the great advantage of a good and cheap supply of glazed earthenware pipes, the cost of putting down these extra sewers will not be so very great, as the sectional area of the new pipes need not be a twentieth of the area of the existing sewers.

If London was divided into nine districts (or as many more as would be found necessary), the works could commence in all the districts at the same time. No enormous bodies of soil, saturated with gas, would be turned up and exposed to the air in the streets, neither would there be a stop put to the traffic, as must be the case if extensive excavations are to be made in the thoroughfares of London; indeed, wherever the deep and large intercepting drains are constructed (one 11 miles long and upwards of 30 feet wide), the neighbourhood will not be bearable from the foul exhalations from

the earth; the shopkeepers will be almost rendered bankrupts from the total cessation from business which must ensue while the large works are being constructed. The referees allude to the probability of the temporary stoppage of some of the thoroughfares; the diversion of the traffic, and also to the very large quantities of materials and surplus earth which will have to be carted through the streets.—(Report, page 38.)

Then, again, I submit that the lay or direction of the intercepting main drains, in the present scheme for the London drainage, as far as rain water or other water is concerned, cannot be advantageous, the rain water should be removed by the most direct course. The natural hollow or valley passing through London, is that occupied by the Thames, and the rain water should run direct into the river north and south. Instead of the rain water north of Kensington flowing only a mile and a-half into the Thames at Chelsea, it will be conducted in the large intercepting sewer eight miles through the City, towards Bow and Plaistow, and from thence, by another large drain, 39 feet wide, and 16 feet deep, 24 miles in length, to the Sea Reach; total, 32 miles, instead of under two miles. Of course, as I before remarked, at certain intervals, during heavy rains, the storm overflows will permit the surplus rain water to make a short cut direct to the Thames. The rain-water journey through London will intersect about 115 sewers.—(See Report, p. 185.)

With regard to the objection against any alteration of the sewers, from the difficulty of doing such without interfering with the numerous gas and water pipes, there can be no necessity for such a number of pipes in one street, and I beg to urge upon the Metropolitan Board of Works the great necessity of a stop being put to the unlimited laying down of gas and water pipes, especially the former. In the premiums lately given for the best plan of subways, it could not escape observation that one gas pipe and one water pipe, or not more than two of each, were shown in the drawing exhibited to the public at the Society of Arts, and, certainly, under any circumstances, two gas pipes running through a street should be amply sufficient; but what is the fact? Why in Parliament-street (as shown in the Report) there are eighteen pipes, 12 of which number are gas pipes, 4 water pipes, 1 for the telegraph, and 1 drain, beside the sewer. When we further examine the subject, we find that the Chartered Gas Company own 5 pipes, the Equitable 3, the London 3, and the East Gas Company 1. As to the water works, the Chelsea company have 2 pipes, and the Orange-street works two pipes.

In another example given in the report, namely, Bridge-street, there are 16 pipes, thus, Chartered Gas Company, 4; Equitable Gas, 3; London, 3; East Gas Company, 1; total, 11 gas pipes; Chelsea Water Works, 2, and Orange-street, 2; total, 4 water pipes; and 1 telegraph pipe. Rounding the corner of Cockspur-street, opposite Nos. 13, 14, and 15, there are 9 gas pipes, the Chartered Gas Company having 5, Equitable 3, and the London Gas Company 1, with only 2 water pipes. It appears there are upwards of 30 gas and water mains at Charing-cross.

It cannot therefore be a matter of surprise that the streets are continually rooted up; no subways, I believe, would be required if a restriction was placed on laying down pipes. Surely it cannot be an economical, but a very wasteful expenditure for any company to have 5 gas pipes in one street,—it cannot be necessary, and some arrangement should be made to adopt a system of letting a number of streets or a district by contract, to one Gas Company and one Water Company for a certain period. Instead of 16 pipes threading their course through Parliament-street, two pipes would answer every purpose.

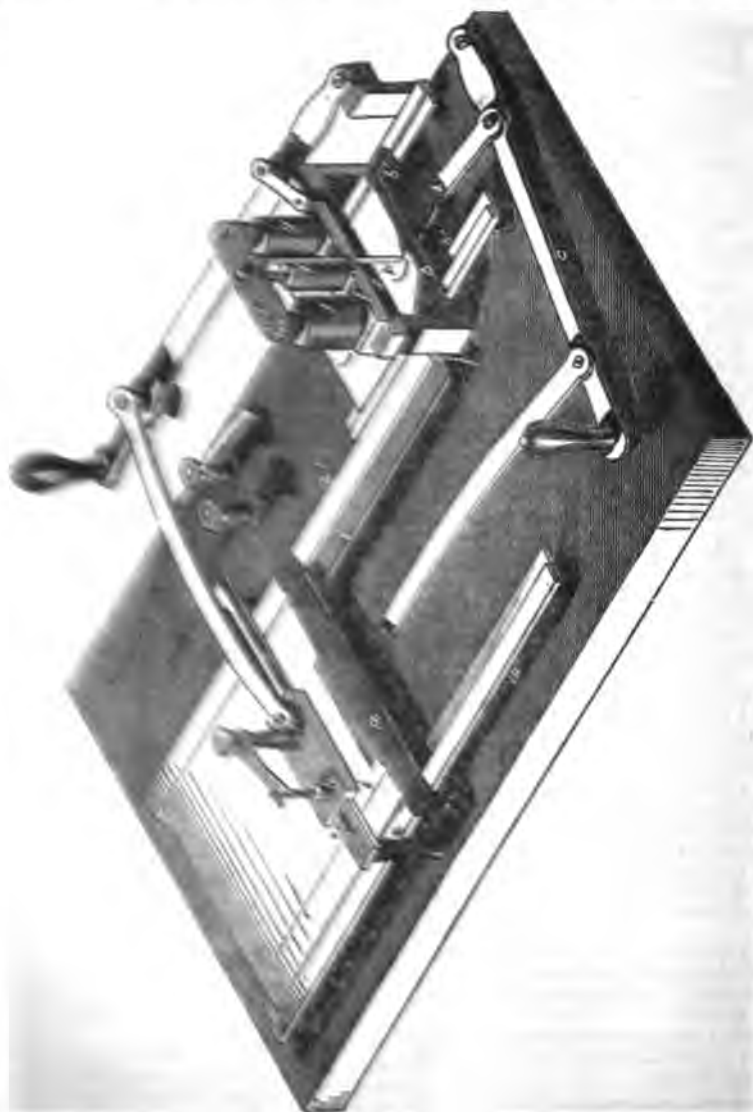
ELECTRO-MAGNETIC ENGRAVING MACHINE.

Under this heading, in Vol. II. of the Society's Journal, 1852, is given the description of a machine invented by Mr. V. Hansen, of Gotha, for engraving and producing engraved steel for surface-rolling. The description is illustrated with an engraving of the machine, and prints from actual specimens produced. Improvements have lately been made in this direction. A patent has been taken out by Mr. R. A. Brownian in this country in behalf of an American gentleman, under the title of "Improvements in machinery in connection with the improvement of electro-magnets or producing copies of designs, drawings, patterns or leaves, or for regulating and bringing into action a graver

by breaking and closing an electric circuit in accordance with some previously prepared design or figure."

The following description is taken from the *Mechanics Magazine* of the 2nd inst. :—

The passage of the design or figure under a "style" effects the breaking and closing of the circuit, and thereby brings into action the graver situated at a distance, but moving in a regulated manner and governed by the action of the style, whereby movements will be imparted to the graver at the moment of the breaking and closing of the circuit. The simplest form of this invention, whereby the general view may be had of its scope and design, is represented in the engraving annexed, and consists in having two metal plates, *a* and *b*, one of which, *a*, is



... be placed at a
... guide frames,
... These
... movement of
... to the other
... will have

upon it the pattern which is to be copied, and the other
b, is the plate intended to be engraved according to the
pattern. If the design is to be on a reduced scale, then
this latter plate will be moved by a link, *d*, placed near
to the fulcrum of the lever, its movements in its guides
being reduced accordingly, and *vice versa*; if enlarged.

its link will be arranged to work from the long end of the lever. Centrally placed over the paths of each of these plates are two other sets of guide-rails, *e* and *f*, striding the first-named guides at right angles. That at *e*, over the pattern plate, has a slide into which is fixed a pointed style, *i*, placed vertically, its point resting upon the pattern plate beneath. Upon the guide, over the other plate, is affixed also a slide, *j*, upon which is a helix, *g*, with magnets, and an armature, *h*, placed properly for being actuated in the usual manner of electromagnets. The armature has affixed to it a graving tool, *k*, standing vertically, having its cutting edge when the armature is not in contact with its magnet, just above the surface of the plate to be engraved. The slide, *e*, having the style *i* in it, and the slide *j*, with the magnetic armature, &c., are also connected together by a lever, *l*, so that the movement of one will produce a like movement in the other, or with the proportional differences of motions, if arranged for enlarging or diminishing, as before stated for the plates. A galvanic battery is now put in connection in such way that one pole thereof will be connected to the pattern plate, and the other pole to the style over that plate, so that whenever the style touches the pattern plate, the circuit will be broken, and when passing over any conducting substance on it will be closed. The effect of this upon the graver is to produce a like action, the closing of the circuit bringing the armature, *h*, upon the magnet which brings the graver, *k*, upon the plate *b*. Now, if while the circuit is closed the pattern plate *a* be moved a certain distance, then will a line be engraved upon the plate *b*, in accordance with the extent of its movement. By coating the pattern plate with some non-conducting material, as varnish, and drawing thereon down to the metal any device, a copy may be engraved by moving the plates and style in the following order:—First, bring the style, *i*, to one side of the pattern plate, the graver, *k*, will also thereby be transferred to one side of its plate. When the style, as the plate is being moved, comes into contact with it, the circuit will be immediately closed, and the graver will also be brought to press upon its plate; the pattern plate now being drawn along, a straight line will be engraved upon the plate *b*, until the style on *a* strikes a place varnished, when the circuit will be broken, and the graver will be lifted off its plate during the passage over the varnished surface. On leaving that the circuit will again be closed, and the graving go on again; this interruption taking place as often as a portion of the pattern plate is intercepted during the passing of that plate under the style. The style is to be lifted up, and the pattern plate returned to the first position, then the style moved the distance across for a next line, and the operation repeated. Thus, the whole plate will be gone over in parallel lines, and the plate *b* in like parallel lines, whereby in those places in which the circuit has been broken by the figures, this plate will accordingly have been engraved in fac-simile if the movements of the two plates have been alike, or will be enlarged or diminished, if actuated as already stated.

Instead of operating the graver directly by the armature and magnet, the inventor proposes various modifications in which this may be accomplished, by the armature setting in operation some suitable machinery according to the breaking and closing of the circuits by the pattern. The use of the invention may also be extended to carving, weaving, &c.

SOCIETY OF ARTS AND OXFORD EXAMINATIONS.

As the Council of the Society of Arts, "with the view of assisting to bring the proposed title of 'Associate in Arts of Oxford' within the reach

of the members of Institutes in union with this Society," have notified that they "will grant to each youth, not less than 16 or more than 18 years of age, who shall obtain, in 1858, three of the Society's certificates of the first class in the subjects contained in the Oxford programme, the sum of £5 towards his expenses, if he attends at the University and undergoes the Examination there," it is thought useful to publish, for the guidance of the members of Institutes in Union, those portions of the Oxford regulations to which the offer of the Council has reference.

EXAMINATION FOR THE YEAR 1858.

The Examination will commence on Monday, the 21st of June, 1858.

Examination of Candidates for the Title of Associate in Arts.

Candidates must be under eighteen years of age on the day when the Examination begins.

I. All candidates at this Examination will be required to satisfy the Examiners in

1. Analysis of English sentences and parsing, and correction of faulty sentences.
2. A short English composition.
3. Arithmetic.
4. Geography.

Every candidate will be required to draw from memory an outline map of some country in Europe to be named by the Examiners, showing the boundary lines, the chief ranges of mountains, the chief rivers, and the chief towns.

Questions will also be set in Geography.

The outlines of English History: that is, the succession of Sovereigns, the chief events, and the characters of the leading men in each reign.

*II. The Examination in the Rudiments of Faith and Religion will consist of questions in

1. The Historical Scriptures of the Old Testament to the Death of Solomon.
2. The Gospels of St. Matthew and St. John, and the Acts of the Apostles.

Those who offer themselves for examination in Greek will be expected to answer questions on the same parts of the Greek Testament.

3. The Catechism, the Morning and Evening Services, and the Litany; and the outlines of the History of the Book of Common Prayer.

III. Every Candidate will also be required to satisfy the Examiners in two at least of the Sections marked A, B, C, D, or in one of those four and in one of those marked E, F.

SECTION A.—*English.*

This will include questions in

1. English History, from the battle of Bosworth Field to the Restoration; and the outlines of the History of English Literature during the same period.
2. Shakspeare's King Lear, and Bacon's Essays.
3. The outlines of Political Economy and English Law.

The Examination will not extend beyond the subjects treated of in the first book of Smith's Wealth of Nations, and the first volume of Blackstone's Commentaries.

4. Physical, Political, and Commercial Geography. A fair knowledge of one of these four classes of subjects will enable a candidate to pass in this section.

SECTION B.—*Languages.*

1. Latin. 2. Greek. 3. French. 4. German.

* This Examination will not be required of any Candidates whose parents or guardians shall have declined it on

ELECTRO-MAGNETIC ENGINE

Under this heading, in Vol. II
nal, pp. 485-6 (June 2, 1854), is
a machine invented by Mr. W.
copying and for producing an en-
printing. The description is illu-
ing of the machine, and prints
produced. Improvements have
direction. A patent has been
Brooman in this country, on the
tleman, under the title of "Ma-
in connection with the engine
for producing copies of de-
devices, or for regulating an

conductor of a
short distance
 a and b , lying
plates are con-
one plate trans-
along these guid-

contents of these reports, will show how very unlikely Mons. Barral was to make any mistake, and how impossible it is that the mistakes, if any (which deny), were intentional. Mons. Barral begins by "translating literally the passage devoted to Canning-park farm, from a report published by the Board of Health, dated 31st December, 1851," and he observes, it is evidently from this official report that Mons. Moll and Dr. Harsteen have derived the greater number of the details as to Canning-park, as may be seen by reference to the *Journal d'Agriculture Pratique*, 20th July, 1852, and 20th February, 1857." He then proceeds, "We will now compare the preceding text with the literal account (*procès verbal*) of the visit which, in company with Mons. de Jussieu, we made to Canning-park on the 7th August, 1857. This *procès verbal* was drawn up the same evening, with no other information before us than the notes taken during our conversation with Mr. Telfer, who most obligingly gave us all the details in answer to our questions on his curious mode of cultivation." "Mons. de Jussieu," he adds, "testifies to the exactness of the following *procès verbal*." Then follows a most minute and interesting description in detail of every part of the management of the Canning-park dairy farm (for which refer your readers to the original work in French); and the report terminates with the general conclusions, which have already appeared in your *Journal*, with some further comments from the editor of *Bell's Messenger*, which called forth Mr. Chadwick's letter.

Mr. Chadwick admits that Mr. Telfer *does use the very amount of artificial manure* described in Mons. Barral's report, to produce the great crops described in the Board of Health blue-book, but he states that as Mr. Telfer is a manure merchant, he is inclined to exalt the "powers of the manures he could sell, at the expense of those he could not sell." I am content to leave that argument, for what it is worth, to the consideration of our readers.

Mr. Chadwick also complains that M. Barral quotes from the report of Mr. Lee, and not from that of the Board. This is a strange objection. Mr. Lee was one of the inspecting engineers of the Board of Health, specially deputed to report to the Board on a number of liquid manure farms. At page 448 of the 3rd *Journal of the Society of Arts*, you will find Mr. Chadwick quoting Mr. Lee's tabular statement of the cost of laying down pipes and pumps, in support of the liquid system of liquid manuring against the water-pipe system now adopted by Mr. Austen, the present engineer of the New Board of Health; and at page 498 of the same volume, answers, showing that not one farm visited by Mr. Lee produced a profit.

Mr. Chadwick then proceeds to protest against Mons. Barral terming Myer Mill Farm, lately managed by Mr. James Kennedy, for his cousin Mr. P. W. Kennedy, the manager of a branch of the Royal Bank of Scotland, "the ruined farm of Myer Mill." At any rate, if Mons. Barral was wrong, he was misled by the formal evidence of all Mr. Kennedy's neighbours, and of Mr. James Kennedy himself, who admitted, 20 years ago, to one of the most distinguished Aberdeenshire farmers, whom I will name if pressed, that *the farm never did pay*. I am a bad hand at writing in Scotch dialect, but the words of James Kennedy's father, in my note book, taken down in Paris, during the Agricultural Exhibition, from my Scotch friend, are as nearly as possible these:—"Jemmy, ye may as well tell the honest man the truth, its a sad bargain the farm." The *Agricultural Gazette*, conducted by one of the ablest agricultural writers, Mr. J. C. Morton, not only stated, at least a year ago, the failure of the Myer Mill farm, but accounted for it by the too great extension of the pipe system. M. Barral, many months after, visited the farm, and found the costly pumping apparatus silent. Mr. Chadwick follows later still. The pumps were still silent. You may remember, on

the discussion of Mr. Fothergill Cook's paper, I stated that the farm was vacant. Is it at work now, or are the boilers still under repair? The tenant or manager has gone south. None of these facts are consistent with success, and yet Mr. Kennedy, the banker, is not unnaturally indignant that his hobby should be termed a failure. Now, Mr. J. C. Morton read a paper at our Central Farmers' Club, in March, 1851, describing these two farms, for the purpose of drawing attention specially to the use of liquid manure in growing Italian rye grass, which is certainly the most profitable use to which that form of manure can be applied. In this paper, Mr. Morton gives an account of Mr. Telfer's farm, which is substantially the same as that given by Mons. Barral, as will be seen in the following extract from the Report circulated among the members of the club:—

"Immediately after cutting the rye-grass, between 3 and 4 cwt. per acre of mixed Peruvian guano and sulphate of ammonia are sown upon it, and one inch, or 100 tons per acre of ley water are poured through pipes, containing such share of the liquid excrement of 48 cattle as belongs to the period since the last pumping. Mr. Telfer lets the water on direct from the pipes to the land; he does not send it flying in a stream through 40 or 50 yards of dry air, which would run off with half its excellence, but he sends it directly to the roots of the plants. Three cuttings up to October, each followed by a washing-in of artificial manure, to the extent of from 3 to 4 cwt. per acre, so that "during the two years that will have yielded 100 tons of green food per acre, in seven cuttings, by the use of a ton of guano, sulphate of ammonia, and nitrate of soda, washed in with a hundred tons of dilute liquid." Nothing about wheat here!

In describing Mr. Kennedy's farm, Myer Mill, Mr. Morton mentions that he purchased from 800 to 1,000 gallons of gas-water (ammoniacal liquor), at 6d. per gallon; and applied it with the liquid of 150 cattle and the manure of 450 sheep, kept on boards, to 84 acres of Italian rye-grass, out of 900 imperial acres, 420 of which were under the system of under-ground irrigation. "Seven thousand cubic yards of solid manure used for the arable crops."

But I have another piece of evidence about Mr. Kennedy's farm, from the "*Troisième Voyage Agricole en Angleterre et Ecosse*," par le Comte Conrad de Gourcy, which took place in 1851, and was published in 1855. He says, at page 176, "La fameuse ferme de Myer Mill appartient à M. Kennedy. Celui-ci l'a louée à une personne portant le même nom, ayant le goût des expériences et faisant faire des travaux immenses dans cette ferme, mais M. Kennedy a assuré le fermier que ses améliorations n'étaient pas profitables, il n'en souffrirait pas."

Now, as Mr. Kennedy the banker was to bear all the risk of Mr. Kennedy the farmer, it is not difficult to understand that the next tenant might, as Mr. Chadwick states, pay double rent, and yet not pay a heavy rent.

I think I have given above conclusive evidence that Mons. Barral has made no misrepresentation in his description of the liquid manure farms. He read, in the works of the Board of Health, and in the papers read by Mr. Chadwick and Mr. Ward, at Brussels, of extraordinary things done with liquid manure and liquid sewage; he came, saw, and questioned, and found the only brilliant results in artificial grass crops obtained by the liberal use of guano and other expensive substitutes. He found no crops of wheat grown with liquid manure; he looked in vain for forty bushels an acre from the sewage of Rugby, or twenty bushels, or even ten. So he wrote down what he saw, and I confess that his exact matter of fact detailed statements, printed, as they are, side by side with the Board of Health Reports, are very provoking.

As to Rugby, it is true, as Mr. Chadwick stated, that Mr. Campbell, under his lease, pays a heavy rent to Mr. Walker for part of the sewage of Rugby, but it is also

A fair knowledge of
a. Candidate to pass in the

SECTION

1. Pure Mathematics

2. Practical Mechanic
Hydrostatics, mathematics
Navigation.

Algebra to the end of
Books of Euclid will be
Section.

SECTION

1. Natural Philosophy

Great importance will be
drawing.

2. Chemistry.

Questions will be set
ples of Chemical Science.

There will be a practical
of Analysis.

3. Vegetable and Animal

Questions will be set
ral, and on the functions of
biology.

Parts of plants and animals
for description.

Great importance will be
and Anatomical dissection.

A fair knowledge of
enable a candidate to
cases a practical acquaintance
will be indispensable.

SECTION

1. Drawing from nature
and in Perspective
Elevations.

2. Design in pen and ink

3. The History of Art

A fair degree of
required in order to
section.

1. The Grammar

2. The History of

tion.

The Elements of
order that a Candidate

Separate lists of
be published for
arranged in two

The names of
order of merit
cally.

The names of
printed in a general

After each section
his age, the place
from which he

Every candidate
Chancellor's Office
in Arts, and
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The fact that
in the Rudiments
on his certificate
the list.

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expedient.

Local committees
in their several
nation from

OXFORD FREE LIBRARY.—Some interesting statistics of the Oxford Free Library, prepared by Mr. Dewe, the librarian, have just been issued for the quarter ending Nov. 30, 1857. The results are generally of a satisfactory character, and show a great increase over the preceding summer quarters, both in the number of visitors and readers. The number of daily visitors for the quarter is 33,325; total number of book readers 5,860, of which 3,832 were novels and tales; 1,135 poetry, the drama, and miscellaneous literature; 491 history, travels, and biography; and 412 theology, philosophy, science, and art. The average number of daily visitors during the quarter was 408; daily book readers, 64; and Sunday evening visitors 70. The library now contains 4,580 volumes. A separate statement has also been issued, showing the operation of the lending library for the month of November. The total number of volumes in this department is 1,025, and the estimated number of borrowers' cards issued 191. 29½ persons have applied for books, and 297 volumes have been issued, of which 270 were novels and tales; 59 poetry, the drama, and miscellaneous literature; 59 history, travels, and biography; and 9 theology, science, &c.

POOLE.—On Tuesday evening, Nov. 24th, Mr. Joseph Darby, of Lytchett, gave a lecture at the Town-hall, in connection with the Mechanics' Institute, on the "Works of Charles Dickens, their Moral and Social Influences." Mr. Darby gave a lecture on this subject last year, and the present lecture was a continuation of the review of Dickens' writings. The chair was occupied by Mr. W. Vale.

YARMOUTH.—The fourth annual report of the Paedagogical Library and Museum shows that the increase in the number of members is very satisfactory. In the year ending October, 1856, there were 320; there are at present 470, the increase for the past year being 150. The balance-sheet shows, in consequence, a rise in the subscriptions to the library, from £28 12s., the amount received in 1856, to £42 13s. 9d., the receipts for the last year. This may be attributed partly to the effects of the early closing movement, partly to the attractiveness of the lectures and musical evenings, and partly to the festival held at the Christmas anniversary. The library now numbers 2,772 volumes, showing an increase of 149 during the year. The state of the finances authorises the Committee to recommend that a further sum be at once laid out in the purchase of books. The issue of books to subscribers has been 6,635; and including the book-club circulation of 4,120, we obtain a total of 10,755 books issued. Books of reference and other works have been extensively used in the reading-room. The following are the number of volumes of each class of books circulated during the year:—Arts, science, trades, manufactures, 170; anatomy, 9; biography, 280; dictionaries, encyclopaedias, 14; education, 24; fiction, 1,820; geography, 870; geometry, 7; history, 578; literature, 109; miscellaneous, 155; natural history, 100; periodicals, 580; poetry, 135; political economy, 71; physical science, 80; theology, 485; juvenile library, 1,648; total, 6,635. 7,750 has been the total attendance at the reading-room, being an average of twenty-five a night, and the committee foresee that they will shortly have to turn their attention to increased accommodation. To meet the wishes of many of the members, the book-club has been divided into two branches, the one circulating books weekly, the other fortnightly. The number of subscribers are, to the weekly, 72; to the fortnightly, 21; total, 93. The lectures were, for the most part, delivered gratuitously, and the attendance has proved how much they were appreciated, not only by the members, but by the residents generally. The lecture season commenced on the 30th September, 1856, and closed May 5th, 1857, during which the following were delivered:—Sept. 30, 1856, "Early Closing: Time and the Kalender" (dissolving views), Rev. G. Hills, B.D.; Oct. 14, "British Navy" (dia-

grams), Rev. G. Pellew, B.A.; Oct. 28, "Paris" (dissolving views), Rev. N. T. Garry, M.A.; Nov. 11, "How we Breathe, What we Breathe, Why we Breathe" (diagrams), Rev. A. H. Locock, M.A.; Nov. 20, Musical Evening, conducted by Mr. H. Stonex; Nov. 25, "Nineveh" Part I. (diagrams), Rev. T. Hammond Tooke, M.A.; Nov. 27, ditto, Part II.; Dec. 9, "The Temples" (dissolving views), Rev. E. Yates, M.A.; Dec. 23, "Curiosities of Insect Life" (diagrams), E. Wheeler, Esq., C.E.; Jan. 20, 1857, "The Late War in the Crimea," Rev. H. P. Wright, M.A.; Feb. 3, "Venice" (dissolving views), R. H. I. Palgrave, Esq.; Feb. 12, Musical Evening, conducted by Mr. H. Stonex; Feb. 17, "Olives and Maccaroni," Rev. M. Mitchell, M.A.; March 8, "Ancient and Modern Rome" (diagrams), Rev. H. Dupuis, B.D.; March 17, "The House we Live in, and how to take care of it" (diagrams), Rev. M. H. Beaumont, M.A.; March 31, "Holy Places" (dissolving views), Rev. G. Hills, B.D.; April 14, "The Highlands of Scotland" (dissolving views), Rev. Dacres Olivier, M.A.; April 21, the same repeated; April 28, "Cairo and the Pyramids" (dissolving views), Rev. G. Hills, B.D.; May 5, the same repeated. Every year adds something to the interest of the museum; the branch of it which is best represented is ornithology. The whole collection of specimens have been classified and arranged as much as possible during the past year. With reference to the evening classes, free instruction has been given as usual in reading, writing, and arithmetic, to adults of the working classes. The school opened on the 3rd October, 1856, and closed 1st May, 1857. The average attendance was 29, and the total number of those who availed themselves of it was 89. Classes were opened last year on the following subjects:—Ecclesiastical History, English History and Literature, English Composition and Writing from Dictation, French, Latin and Roman History, Mathematics, the Elements of Navigation, Vocal Music, and Short Hand. The Committee hope ere long that some of the members may be found sufficiently advanced to attend the Examinations of the Society of Arts with good hope of success. Meanwhile, the Committee offer prizes in each class. The attendance at the French class was, male class, 15; female class, 8. For the mathematical class 28, for the music class 31 names were entered. The Mutual Improvement Society has been revived, under the care of a sub-committee; its operations will extend to debates on given subjects, rehearsal of speeches from the best English authors, essays on given subjects, and the like. As an additional stimulus to mental cultivation, the Committee offer a prize of £2 for the best, and £1 for the second-best essay, to be competed for by clerks in offices, and assistants in shops, whether members or not of the Institution. In consequence of a resolution passed at the last annual meeting, a Committee was formed to put in practice, as far as possible, the principles of early closing. The Committee named, met with a success which had never attended any similar attempt in former years. The drapers, grocers, stationers, almost unanimously, and some others, closed their shops at 7 o'clock, from November to April. It will be the earnest endeavour of the Early Closing Committee to re-establish and extend the benefits of this important movement during the approaching winter. A Christmas Exhibition and Entertainment was given with great success. The programme of the entertainment promised fifteen lectures; four or five of these were given each morning and evening, in order that visitors, either in the morning or evening, might hear the whole course, and yet have time to examine the exhibition. The collection of pictures included specimens of many of the best masters. The best thanks of the Committee, and indeed of every visitor, are due to all contributors to this manifold entertainment, and to all who assisted in the arrangements.

Society of Arts.

JANUARY 15, 1858.

NOTICE TO INSTITUTIONS.

It has been for three years a member of, or student of a Union with this Society, for the Final Examinations. Examinations within reach of the Institutions and small Adult Instruction, which cost two guineas for union with the Provincial Union or Association for the promotion of which any unite with itself any Institution and Small district, and give to the Union with the Society of the Examinations, for a single Two Guineas.

NOTICE IN FINE ART.

We are very desirous of obtaining evidence of any fraudulent or wrongful acts relating to the Fine Art. Members and others in possession of such facts are requested to communicate the same to the Secretary of the Society of

NOTICE—EXAMINATIONS.

At a meeting between the Council of the Society of Arts and the Representatives from the Institutions in London and its neighbourhood, on Monday, the 11th inst., at six o'clock, was taken by C. Wentworth Dilke, Secretary, and Chairman of the Council, who explained the object of the meeting by explaining the object of the Union in convening it, and called upon

MR. CHESTER, V.P., who said that, however successful the Examinations hitherto conducted by the Society had been, as far as they went, yet it must be obvious that the Institutions scattered as they were over the kingdom, that the system hitherto adopted did not give to their members the facilities for which they had a right to expect. Last June there were two centres of Examination, one in London and one in Huddersfield. The result showed that only 37 per cent. of the candidates availed themselves of them. Hence, the decision of the Council to adopt the present scheme, which was detailed in the Programme which had been circulated to all the Institutions in the Union. The Council decided to throw some portion of the management of the Examinations upon the Institutions, feeling assured that they were greatly for the advancement of the Institutions and that the Society should not do for them that which they could well do for themselves. Mr. Chester then pointed out the nature and duties of the Local Boards in connection with the scheme, as detailed in the Society's Programme, and stated that the Northern Union

of Mechanics' Institutions, embracing the four northern counties, the Yorkshire Union of Mechanics' Institutes, the Institutional Association of Lancashire and Cheshire, the Hants and Wilts Adult Education Society, and the Bucks and Berks Association, were already possessed of an organisation, which was being brought into operation for forming Local Boards to co-operate with the Society. At Sheffield the Mayor had convened a meeting of Representatives of the Institutions in that town, and a joint committee had there been formed to carry out the Society's Programme. At Brighton a meeting was about to be held for the same purpose, and the Council were in communication with many other towns where the like proceedings were taking place. The present meeting was called to facilitate similar arrangements in the London districts. He suggested that it would be convenient that several Institutions in a district should form a joint Board. This Board need not be numerous. The duties it must necessarily discharge under the programme were very simple, though doubtless others, of great importance to the improvement of education, might well be discharged by such a Board when once formed. The necessary work would be—1st, To test the Candidates in the elementary subjects, and to ascertain whether they were likely to pass in the special subjects comprised in the papers to be sent by the Society's Board. 2nd. To superintend the working of the Society's papers by those candidates who had previously passed the Local Board, and to certify that the work had been done without copying, or the assistance of books, &c. Under these arrangements, it would be seen that the Candidates passed by the Local Board, would not have to leave their localities to be examined by the Society's Board; the papers would be sent down by that Board to be worked in their several localities. For these necessary purposes the Local Board need not be numerous; in fact, two or three gentlemen possessing the confidence of the Institutions could do the work. The committee of the Crosby-hall Evening Classes had already formed a Local Board, and were ready to admit to it the members of such Institutions as were disposed to join them, upon certain terms. The Polytechnic Institution was also ready to form a Local Board, and to admit such Institutions as thought it desirable to join that body.

A conversation then ensued, in which Messrs. Smurthwaite, Edwards, Chester, Rev. C. Mackenzie, Winkworth, Sir Thos. Phillips, Hamilton, Andrews, Rev. W. Bashall, Pearall, Buckmaster, Rev. R. Whittington, Rev. W. Hodgson, and others took part, when it was moved by the Rev. Charles Mackenzie, and seconded by Mr. Edwards, and resolved *nem con*.

"That the Council invite the Secretaries of the various Institutions in London, in union with the Society of Arts, to meet at the Society's house, for the purpose of suggesting convenient places in which Local Boards may be formed."

A vote of thanks to the Chairman having been passed, the meeting separated.

SIXTH ORDINARY MEETING.

WEDNESDAY, JAN. 13, 1857.

The Sixth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 13th inst., Thomas Sopwith, Esq., M.A., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Ames, Edward Levi, M.A. | Macadam, Charles Thos. Odams, James.

The following Institution has been taken into Union since the last announcement:—

450. Sheffield Church of England Educational Institute.

VACCINE LYMPH has made some success with vaccine virus by so instead of the solid three months in water without a single three or four pieces to be occasionally care.—*Amer. Jour.*

MEETINGS

- Mon.** Society of the Med. Architects the City Mr. Geo. History Geographical rest and the Am. Exped. Esq. R.
- Tues.** Syro-Egypt. Civil Eng. dress Railways Med. and Zoology
- Wed.** Literary Society stages the L. Graphic Microsc. Archeol.
- Thurs.** Royal Antiq. Roy. Asiatic
- Sat.** Medical

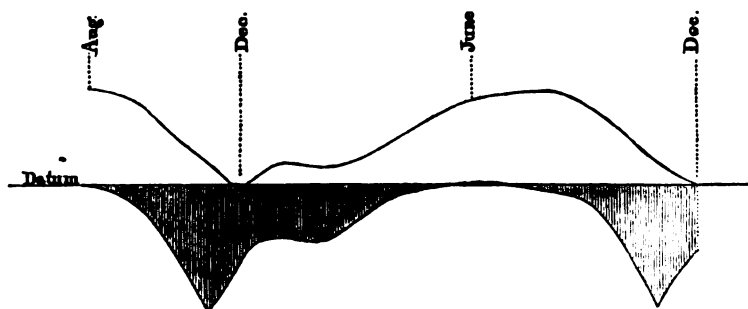
PATENT

APPLICANTS

2854. Jean S. make
2785. Peter A. and J. engine
3050. Richard make built
3066. John C. men. ratu
3066. John C. Imp. used for
3080. Matthe serv and

No. in the Register.

4040
4041
4042



EXPLANATION.—The datum line separates the water that percolated into the lower regions of the earth, and supplied the rivers upon which Mr. Dickinson's mills were situated, from that which re-ascended by evaporation, or was appropriated by vegetation, and therefore lost to Mr. Dickinson.

The experiments made by me at Hinxworth (see Appendix), from 1st October, 1856 to 31st May, 1857, *i.e.*, from the time the drainage executed there began to discharge water to the time the drains ceased to run, show that the quantity of rain which percolated the soil, and was discharged by the under-drains, was very much greater in the open (water-bearing) strata than in the clay soils. I found that although the clays discharged a larger proportion of heavy downfalls within the first 24 hours than the open soils, the latter actually discharged in the aggregate nearly seven-tenths of the rain that fell in the eight months, while the former did not disgorge much more than one-fourth of the rain that fell upon them, although no portion was seen to pass off the surface. The well-known retentive property of clays is clearly exhibited by this remarkable difference; and if the quantity of water discharged by the drains can be taken as indicative of the quantity of evaporation prevented or diminished, the difference would appear to destroy the assumption of the Board of Health (1850), that evaporation "is constant."*

Such are the conflicting opinions as to evaporation, but

* The conservative character of clay soils is well expressed in the following old distich:—

"When the clay shall feed the sand,
Then it's good for old England;
But when the sand feeds the clay,
Then she cries, 'Oh! lack-a-day.'"

I do not propose to go further into the wide, though very important, topics of climate and its influence on animal and vegetable life, but to confine myself to those practical questions connected with engineering, with which I feel myself better qualified to deal.

It has been in the furtherance of the very important works of agricultural drainage and town sewerage that several millions of public money, and borrowed money to be repaid by local rent-charges, have been expended. The Inclosure and Drainage Commissions have governed the expenditure in the one case, and the Health of Towns Commission that in the other. For eleven years and more, public money has been expended, in the first instance in Ireland, and subsequently in England and Scotland, without any effort to supply the desideratum, which I hope to show is so manifestly essential to economy and efficacy in all works designed for the removal or utilisation of surface water.

I have tabulated all the returns I could collect of an authoritative kind, with the kind assistance of Mr. White, of Camberwell, and they are given in the following schedule. To render the amount of information we possess as clear as possible, and to show how little that information is, I have marked the site of each station on a map of the British Isles, over which lines are ruled, latitudinally and longitudinally, at intervals of ten miles, so that the eye may judge, comparatively, of the wide spaces upon which no records have been kept. Each square encloses 100 square miles.

TABLE OF RAINFALL, SHEWING THE STATIONS IN THE BRITISH ISLES RECOGNISED AS DULY AUTHORITATIVE.

Latitude.	Name of Station.	Rainfall.	Authority or Observer.
Deg. Min.	ENGLAND.		
50 05	Helston	36-80	Registrar-General.
50 07	Penzance	44-70	<i>Philosophical Magazine</i> , Whitley.
50 10	Falmouth	43-7	Royal Institution of Cornwall.
50 14	Truro	33-63	Registrar-General, Whitley, and Allnutt.
50 30	Teignmouth		Registrar-General.
50 30	Tavistock	53 6	Whitley.
50 30	{ Goodmoor	57-5	Whitley.
	{ Dartmoor		
50 41	Little Bridy	38-70	Mr. Eaton, M.B.M.S.; Registrar-General.
50 42	Exeter	32-58	Royal Institution of Cornwall, Whitley, Allnutt.
50 45	Gosport	31-07	Simmonds. (Burney, 29.5)
50 47	Worthing		Registrar-General.
50 52	Hastings	28-00	Milner.
50 54	Southampton	29-83	Lieut.-Colonel James (two years), Allnutt.
50 58	Uckfield	28-70	Allnutt.
51 16	Cobham	25-46	Royal Institution.
51 16	Maldstone	21-29	Mr. Fielding (two years), Allnutt.
51 27	Bristol	29-2	Prout, Whitley. (Allnutt, 30-12)
	Clifton (near)		Registrar-General.
51 29	Oliswick	24-8	Howard.
51 28	Lewisham		Mr. Glaisher.

TABLE OF RAINFALL (CONTINUED.)

Latitude.	Name of Station.	Rainfall.	Authority or Observer.
Deg. Min.			
51 29	Greenwich	21·37	Royal Observatory.
	London	22·2	Daniel.
51 30	Camberwell	24·65	{ Mr. W. H. White, late Secretary to the Meteorological Society.
51 33	Upminster	19·50	<i>Penny Cyclopædia</i> .
51 36	Swansea	36 60	Jenkins, Whitley.
51 39	Enfield	22·50	Mr. Heath (four years), Registrar-General.
51 40	Epping	26·39	Royal Institution.
51 43	Stroud		<i>Cyclopædia of Agriculture</i> .
51 45	Hartwell		Registrar-General.
51 47	Aylesbury	21·00	Milner.
51 45	Great Berkhamstead	29·14	Mr. Squire, M.B.M.S.; Registrar General.
		24 06	Allnutt.
51 46	Oxford	27·74	Mr. Johnson, Registrar-General.
		22 00	Milner.
51 50	Gloucester		Registrar-General.
51 50	Monmouth	30·00	
51 54	Cheltenham	25·25	Mr. Moss.
51 54	Bicester		Registrar-General.
52 03	Roydon	26·00	Mr. Wortham, M.B.M.S.
52 04	Hereford		
52 07	Cardington		Registrar-General.
52 08	Lampeter	36·69	Rev. S. Matthews, M.A. (Allnutt.)
52 08	Bedford	27·	Milner.
52 12	Worcester	26 35	(?) (Two years only) Allnutt, Registrar-General.
52 13	Cambridge	20 00	Milner.
52 17	Thwaite	23·27	<i>Cyclopædia of Agriculture</i> .
52 25	Thetford	19·00	Milner.
52 37	Norwich	22·55	(?) Whitley, 25·5.
52 54	Grantham, Belvoir Castle	24·03	Registrar General, Mr. Ingram (3 years).
52 56	Nottingham	25·08	Mr. Lowe, Registrar-General.
52 57	Holkham	27·44	Mr. Shillabear, Registrar-General.
52 58	Derby	27·	Milner, Registrar-General.
53 00	Boston	24·90	<i>Philosophical Magazine</i> , Whitley.
53 10	Hawarden	23·42	Allnutt (two years), Registrar-General.
53 20	Knutsford	23·36	<i>Philosophical Magazine</i> .
53 25	Liverpool	36·18	(?) { Natural History Society (4 years)—(<i>Journal of Science</i> , 34·1.) Registrar-General.
53 29	Manchester	36·14	<i>Farmers' Encyclopædia</i> .
53 29	Marple	36·56	
53 29	Chapel-le-frith	42·98	
53 30	Bolton	46·74	
53 31	Bury	41·72	{ It is believed that the staff-gauge may have been used for ascertaining the fall in these places; and the staff-gauge is not to be relied upon.
53 31	Rochdale	46·75	
53 31	Blackstone Edge	36·29	
53 31	Fairfield	34·84	
53 39	Ackworth	26·	<i>Philosophical Magazine</i> .
53 42	Wakefield		Registrar-General.
53 45	Leeds	20·04	Mr. Denny (four years), Registrar-General.
53 58	York		Registrar-General.
54 17	Scarboro'	22·89	Registrar-General, Mr. Barrington Cooke.
54 21	Kendal	58 00	<i>Journal of Science</i> .
54 25	Seathwaite	146·40	Royal Society.
54 30	Gatesgarth	121·40	Royal Society.
54 33	Keswick	63 60	Royal Society.
54 33	Whitehaven	47·10	Royal Society.
54 37	Cockermouth	48·50	Royal Society.
54 46	Durham	30·56	Registrar-General.
54 53	Carlisle	30·55	Simmonds.
55 01	North Shields	25 00	Milner, Registrar-General.
	Bywell		Registrar-General.
IRELAND.			
51 55	Cork	36·03	Royal Institution. (40·20, another observer.)
52 29	Limerick	35·00	Mr. Peterman.
52 35	Toomevara	40·50	Whitley.
53 10	Portarlington	27·15	Dr. Hemlow (two years only)
53 20	Dublin	24·60	Trinity College.
53 42	Edgeworth-town		Transactions of Irish Academy, Whitley.
54 10	Colony	42·00	Whitley.

TABLE OF RAINFALL (CONTINUED).

Latitude.	Name of Station.	Rainfall.	Authority or Observer.
Deg. Min.			
54 21	Armagh	25.26	Dr. Robinson (two years).
54 36	Belfast	27.49	{ Queen's College. (30 to 39½, say Belfast Society for Promoting Knowledge)
55 00	Londonderry	—	Transactions of Irish Academy.
SCOTLAND.			
55 13	Applegarth Manse	33.60	<i>Philosophical Magazine.</i>
55 34	Makerstun	24.32	Mr. Hogg (two years only).
55 50	Glasgow	30.00	McCulloch, Whitley.
	Carbeth	42.50	Ditto.
55 51	Rothsay	38.50	<i>Cyclopædia of Agriculture.</i>
	Mount Stewart	46.60	Whitley.
55 54	Annatt		
55 55	Dalkeith	22.00	McCulloch.
55 57	Greenock	40.00	Milner.
55 58	Dunoon	56.00	Ditto.
55 58	Edinburgh	24.00	Professor Johnson, Simmonds.
56 00	Peebles	28.70	Milner, McCulloch.
56 04	Lochiel's Head	37.00	Mr. Malcolm (two years).
56 10	Kinfauns Castle	25.60	140 feet above sea.—Whitley.
	Hill near	41.60	600 feet above sea.—Whitley.
56 29	Dundee	22.00	McCulloch.
57 09	Aberdeen	23.80	Simmonds.
57 16	Clunie	25.00	Milner.
57 18	Alford	37.90	<i>Edinburgh Philosophical Journal.</i>
57 28	Inverness	26.00	Milner.
ISLANDS.			
49 12	Jersey		
49 33	Guernsey		Registrar-General.
	{ Ventnor ... }		Registrar-General.
50 42	{ Newport ... } Isle of Wight...	29.80	Mr. Bloxam (two years).
	{ Ryde ... }		Registrar-General.
54 10	Isle of Man	36.25	<i>Journal of Science.</i>
58 12	Lewis	30.06	Sir James Matheson, Bart. (two years).
59 00	Orkney	36.83	<i>Philosophical Magazine.</i>

Note.—These Stations have been selected as those which are deservedly authoritative. They have been selected from standard published tables only. Most interesting and valuable information is given in the reports of Mr. Homersham as to the relative effect of height of station, using the same gauge, with precisely the same treatment in every other respect.

Although the agriculturist, the engineer, and the physician will be unable to apply practically the information this schedule gives, the curious in matters of science will be struck with the following facts:—1st. That the rainfall in one district is more than seven times that of another; 2nd. That the difference of rainfall at one point, compared with another, is as much as 127 inches; 3rd. That the rainfall on the western side of England ranges from 30 to 51 inches, while that on the south-eastern side ranges from 16 to 24 inches; hence the "mean" of the one is double that of the other [See also *McCulloch*]; 4th. That the rainfall on the western extreme (Penzance) is 44.70, while that on the eastern (Thwaite, in Suffolk) is 23.27; 5th. That comparing places, of the same degree of latitude, the rainfall at Manchester (lat. 53 deg., 27 min.) is 36.14; at Nottingham (lat. 52 deg., 57 min.), 25.08; and at Boston (lat. 53 deg.), 24.90; 6th. That the rainfall in the Isle of Man (lat. 54 deg., 15 min.) is 36.25; at Kendal (lat. 54 deg., 21 min.) is 58 inches, and at Scarborough (lat. 54 deg., 17 min.), 22.89; 7th. That comparing places on the same geological formation, i.e., with soils very possibly the same mechanically and chemically, the following differences will appear. Take the old red sandstone, which is found in South Devon, in Monmouthshire, and in Shropshire; the rainfall at Dartmoor (Goodamoor) is 57½ inches; at Monmouth 30 inches; and at Mount Stewart 46½. On the lias, with its close clay,—which crops out in Dorsetshire, and extends to the north of Yorkshire, taking

Grantham in its course—the rainfall at Little Bridy is 38.70; at Grantham 24 inches; and at Scarborough 22.89. Or if we come nearer home, on to the outskirts of the London basin, we find, at Cambridge and Thetford, the rainfall is less than 20 inches; at Gosport and Hastings nearly 29 inches; and in London, midway between the escarpments, it is 22.2 (Daniel).

Having shown, as far as I am able, the amount of information which at present stands on record, it remains to be exhibited how a perfect system of registration might be made available in the hands of the engineer for a better mode of under drainage, improved means of arterial drainage, and the profitable application of drainage and surface waters.

1. *Under Drainage and Sewerage.*—As the removal of surplus surface water is the primary object of agricultural drainage, and as the rain falling on the surface of town districts is the main obstacle with which engineers have to contend in designing the sewerage of towns, it can hardly be necessary to show that the very first question to be solved should be the amount of rainfall peculiar to each locality.

This assertion in respect to the under-draining of land has been always met by the statement that the drains used are so numerous in the aggregate, and so much more capacious than can be required under any circumstances, that it is an unnecessary refinement in the application of science to inquire into the quantity.

TABLE OF

Latitude.		Name of Station.	
Deg.	Min.		
51	29		
51	30	Greenwich	2
51	33	London.....	2
51	36	Camberwell	24
51	39	Upminster	
51	40	Swansea	
51	43	Enfield	
51	45	Epping	
51	47	Stroud	
51	45	Hartwell	
51	46	Aylesbury.....	
51	46	Great Berkhamstead.....	
51	50	Oxford	
51	50	Gloucester	
51	54	Monmouth	
51	54	Cheltenham.....	
52	03	Bicester.....	
52	04	Royston	
52	07	Hereford	
52	08	Cardington	
52	08	Lampeter	
52	12	Bedford.....	
52	12	Worcester.....	
52	13	Cambridge	
52	17	Thwaite	
52	25	Thetford	
52	37	Norwich	
52	54	Grantham, Belvoir Castle...	
52	56	Nottingham.....	
52	57	Holkham	
52	58	Derby	
53	00	Boston	
53	10	Hawarden.....	
53	20	Knutsford	
53	25	Liverpool	
53	29	Manchester	
53	29	Marple	
53	29	Chapel-le-frith	
53	30	Bolton	
53	31	Bury	
53	31	Rochdale	
53	31	Blackstone Edge.....	
53	31	Fairfield	
53	39	Ackworth.....	
53	42	Wakefield.....	
53	45	Leeds	
53	58	York	
54	17	Scarboro'	
54	21	Kendal	
54	25	Seathwaite	
54	30	Gatesgarth	
54	33	Keswick	
54	33	Whitehaven.....	
54	37	Cockermouth	
54	46	Durham	
54	53	Carlisle.....	
55	01	North Shields ..	
		Bywell	
		IRELAND	
51	55	Cork	
52	29	Limerick	
52	35	Toomevara	
53	10	Portarlington ..	
53	20	Dublin	
53	42	Edinburgh	
54	10	Edinburgh	

adequate depth for want of effective outfall; of numerous rivers and streams to the increasing quantity of water in the underdrainage of the water-lands; and, 3rdly, the sudden discharge of underdrains of clay lands immediately after rain.

Underdrainage is the depth of free soil which will pass to the drains. In an open soil will suffice to keep down the level of the water, actually as the numerous drains of the amount by which evaporation is diminished. The drainage must be very different in the two cases. In the open water-bearing soils, the evaporation must be greatly diminished by the clays it would appear to be very different under any circumstances, it may be ascertained by the amount of water arrested from the underdraining, that quantity is discharged by the main and tributary outfalls in the same manner as previously.

In the Appendix the occasional drains in the mixed soils (see Mr. Way's analysis) are relieved of excessive wetness were yards asunder, and from 4 to 7 feet deep. In the open soils, the subterranean water the universal law, gradually rose to the level replenished by the winter's rains, corroded the old Wiltshire saying, "As the days of springs strengthen." The water that so often found escape by excessive evaporation in March, April, and May, and by cozing the grounds in the nature of springs, which might as the summer advanced, and as the water level declined. After draining, the water discharged by the underdrains from the soils during the period they were run, 50,920 gallons per acre, out of 227,240 gallons the rain gauge showed fell upon every acre of land it is fair to assume that the greater part, if not the whole, of this large quantity of water was that which had been dissipated by evaporation if the land had not been drained (See Johnstone's Elements of Chemistry, pp. 124, 125), for it does not appear the supply to the rivers has been in any way affected in the summer season. These open lands were dis- throughout the greater part of January and when evaporation is very trifling, above 1000 gallons per acre per diem of that water which would have been in the soil until the east winds of early spring the influence of the sun in May and June had converted into vapour at the expense of vegetation. When the quantity is multiplied by the number of acres of land drained and to be drained in these islands, the quantity of new water which has to find its way into outfall streams will be appreciated.

Turning again to the Hinxworth records, we find a different result with respect to the clay-lands, which were drained uniformly 4 feet deep, 25 feet apart (see Mr. Way's analysis). The quantity discharged from the numerous underdrains while they were run, was 59,936 gallons per acre, leaving 167,384 gallons in the soil to be lost by evaporation and appropriated by vegetation. Before draining these clay lands, that portion which the soil could not absorb had flowed off the surface to the outfalls, or remained in the soil to be evaporated. After draining, the rain-fall penetrated to the depth of the drains, and when once the summer rains had completely replenished the absorbent demands of the soil, and the two powers of gravitation and attraction had struck a balance, a large proportion of the succeeding rain was immediately discharged by the underdrains. There was a fall of rain at Hinxworth in October, 1856, of 1.645, and in November of 1.630, equal together to a supply to the soil of 74,067 gallons, or 330 gallons of water per acre. The drains just began to trickle

on the 27th of November, after a fall of half an inch of rain (.540). The test holes in the land showed that the soil was rapidly feeding itself and that the water level was rising, but had not reached the level of the drains. On the 12th December, the outlets were running 160 gallons per diem per acre after frequent rains in the early part of the month of less than a tenth of an inch per diem. On the 13th, the rain gauge showed a fall of .542 (nearly half an inch), and the outlets increased their discharge from 160 gallons to 975 gallons per diem per acre. On the 9th January, 1857, the outlets were running 125 gallons per diem. On the 10th, the rain gauge showed a fall of .542 (rather more than half an inch), and the discharge from the outlets was increased from 125 gallons to 5,150 gallons per diem per acre. How important are these facts in considering the effect of extended underdrainage on the arterial channels of the country, and how necessary a knowledge of the rainfall in providing for it. The Hinxworth records show that the clay lands which prejudice had declared impenetrable, were discharging after heavy rains in the wet season a greater quantity of water per acre than the open soils, and much more than it is believed would have flowed off the surface before the land was drained.

Before quitting the subject of arterial drainage, there appears to be one other point upon which an accurate knowledge of the amount of rainfall would be of signal service. It is admitted on all hands, that no general improvement of outfalls can take place, without a sacrifice of numerous mills and the water power by which they are worked. If a sacrifice such as this is necessary to obtain a national benefit, is it not our duty to look around and see if there be not within our reach a compensatory amount of power at higher points, which may be made available for use by drainage and conservation.

I do not wish to detract from the attention I hope to secure to the object of this paper, by dwelling upon points which may be deemed problematical, and will, therefore, simply state that every 37½ cubic feet of water which could be collected by drainage and delivered each minute to a 10-foot wheel, represents the power of a horse, and it is obvious that when height becomes so important an element as it does in the calculation of motive power, it is more than probable that the waters which might be collected and supplied at higher levels within the watershed of main valleys, would go far to make up for the loss of power occasioned by the condemnation of mills below. But here, as in other respects, we are in ignorance of the rainfall at command in each locality, and there are no tangible data upon which to base calculations.

3. Profitable Application of Surface and Drainage Water.

—This part of the subject is a very wide and interesting one, but we can only deal with it cursorily. All rain falling on a surface which from any cause is impermeable, either flows off its sloping surfaces to the outfalls, or rests on its flat or hollow surfaces until evaporation has reclaimed it; and all rain falling on a surface permeable in its natural state, or rendered so by underdraining, either finds its way down to the subterranean water level which feeds the springs at the out-crops, or to the level of the underdrains, which limit the height of stagnant water in all soils.

In each case a considerable portion of the rainfall may be made serviceable to man in some way or other, if quantity, quality, and altitude are favourable for appropriation. The floods which run off the surface may be impounded; the water that rests on the surface may be rescued from evaporation by underdraining; the water that escapes from the water-bearing strata is at all times available; and the water discharged from the underdrains may be concentrated by systematic arrangement.

In every instance, however, a precise knowledge of the rainfall is indispensable, and numberless are the occasions when a want of the knowledge has negated

to convert the "evil of to-day" into the "benefit of to-morrow."

The various uses to which surface-waters and injurious under-waters discharged by drainage, may be applied, are in supplying towns and villages with water for domestic purposes, in irrigation, and as a motive power for machinery.

The impounding of surface and flood-waters in reservoirs in the higher valleys, has been long adopted in this country. Several towns, and nearly all the principal canals in England and Scotland, obtain their supply by this means of collection. Manchester has executed its works at Longendale, and Liverpool at Rivington Pike. In Scotland, Edinburgh has done the like,—and Greenock has collected the water of an area of 5,000 acres, from Ducal Moss to Shaw's Hills, which not only supplies the town with water for domestic purposes, but furnishes two lines of mills with a quantity amounting to above 500,000,000 cubic feet annually. These instances, which might be multiplied by others, extending from north to south along the whole range of the earlier geological formations, are only referred to as illustrative of the application of surface-water by impounding in reservoirs,—a mode of conservation which would be extensively adopted for minor objects throughout the country, were the data of rainfall at command. As minor objects, we may point to irrigation and mill power, of which abundant examples already exist,—particularly in the mining districts of the west and the Highland farms of Scotland,—affording admirable instances of the profitable use of surface-water.*

The quality of the water supplied from impounding reservoirs, is always inferior to that derived from under-draining, to which the soil becomes a filter, and arrests the impurities which find their way into embanked valleys, and are fostered in open reservoirs. The use of drainage water, therefore, is an object which commends itself to the mind of all who consider it. If applied, as it frequently might be, to the supply of towns and villages, it has all the advantages of filtration, and the flow of the drains is never interrupted by frost so long as there is water in the land to discharge. The temperature of deep drainage water will be found to range from 37° to 40°, when the thermometer shows the temperature of the air to vary from 32° to 16°, or from freezing point to 16° below it. Now this is a point of much moment in considering the application of drainage water in rural villages. How many are the instances in which whole villages are destitute of water, and how frequently could the owner of adjacent lands supply the deficiency by concentrating, at a few pounds extra cost, the water he is throwing away when draining. In irrigation and in the supply of water to farm premises for cattle, or, if quantity favours, to put machinery in motion, the application of the non-freezing drainage water seems peculiarly desirable. At present it is seldom thought of, simply because the amount of rain which constitutes the primary supply is unknown, and because all attention is paid to the removal of the enemy (excess of water) without considering how readily that enemy might be converted into a friend. Moreover, a very large proportion of the under-drainage of this country is executed under the management of bailiffs and woodmen, who, in 9 cases out of 10, are quite incapable of devising a concentrating system of drainage, or who may never have seen a spirit level.

* At the Fowey-Consols mine in Cornwall, the water collected from one hill, is brought home by an aqueduct and delivered to 13 wheels in succession, of an aggregate power of 477 horses. Some interesting papers, elucidating this mode of collecting and applying water, were read before the Institution of Civil Engineers, "On the Bann Reservoirs, County Down, Ireland," and "On the Overshot-wheels at Wheal Friendship Mines, near Tavistock." Some good papers on reservoirs for agricultural purposes, are to be found in the "Journal of the Highland Society of Scotland."

In the case of Lord Hatherton, at Teddesley, we have an admirable instance of the application of drainage water to the two-fold purpose of motive power and irrigation. His lordship drained 467 acres of land at a cost of £1508 17s. 4d., and increased the rental £435 2s. 4d. (nearly 30 per cent.) He erected a water-wheel and machinery, and laid out irrigation at a cost of £1,224 4s. 10d., and gained £578 a year by the outlay. (See article Drainage, in the *Westminster Review*, 1842, by the writer.)

It is no sanguine view to declare that there are thousands of estates in the United Kingdom in which a similar advantage might be gained, as a proof of which if we turn again to the Hinxworth Records, we shall find that the quantity of water (160,920 gallons per acre) which ran from the open mixed soils during the period of discharge, would supply power equal to one horse for 11 hours 17 minutes for every acre; so that if the discharge of the 400 acres (of the same soil) could be concentrated at one point—and in larger estates there would be no doubt of it—there would be available a power equal to six horses for 125 days. In my own practice, I have already applied the waters discharged from drainage for irrigation, and the tenants have gladly paid the demand of the owner by which the cost with interest has been liquidated.

As to the mode of obtaining, collecting, and publishing returns of the rainfall, several suggestions have been made. By some it was thought that a weekly return from every church clerk, or some other parochial officer, might be obtained; but inasmuch as the majority of church clerks and parochial officers in the rural districts are engaged in farming pursuits, and are oftentimes away from home from early in the morning till late in the evening, and are otherwise disqualified by their habits and pursuits for the precise work of daily registration, that idea was soon abandoned. Another proposition was to make the returns of rainfall a branch of agricultural statistics. It is needless to say that, as the bill for the latter object was thrown out of Parliament, that proposal has not been encouraged, though there is no doubt the two objects are so allied as to admit of a useful union.

Up to this time, it would appear that no suggestion has been made which has received general approval. In the suggestions I shall venture to make, I purpose keeping to the simple object of a complete record of the fall of rain, without complicating that inquiry with any other. It is believed that a period of 20 years would suffice to obtain the desired information. Either of the several public bodies to which I have referred, i.e., the several national chartered Agricultural Societies, each for their separate country; or the Inclosure and Drainage Commissioners; or the Board of Health; or the Meteorological Societies; or the Registrar-General; are fully competent to act as a central official body for the collection, arrangement, and publication of returns, if the means for defraying the cost of an additional department were placed at their disposal. One responsible officer, as a registrar of rainfall, would suffice to control the department, and would cost, probably, on the whole, £1,200 to £1,500 a year.

The formation of a base of observations throughout the country and the appointment of competent and reliable observers is not so easily disposed of.

It is admitted on all hands that if the collection of these necessary returns were authorised by Parliament, it would not be advisable to trust wholly to voluntary observers, but that a certain number of paid observers* should

* By examining the returns of the Scottish Meteorological Society, it will be seen that the majority of observers are gardeners. Dr. Robinson, of Armagh, informs me that registers were kept at the several coast guard stations in Ireland, under the direction of the Royal Irish Academy, but they have been discontinued since 1851.

on the base of information, with a fore-knowledge that the number of voluntary contributors would increase the returns to any amount that might be considered desirable. The question that then arises is, who are the persons who could be relied upon for correct returns, and who would be satisfied with such an annual payment as would meet the views of the country? And what is the least number of stations that would suffice for a base of information? The less or description of persons who, it would appear, are competent and suitable, and who would, most likely, be content with a small return, are the masters of Unions, the masters of National Schools, the clerks at railway stations, and gardeners of superior establishments. And if the observations are confined to the rain-fall, there is no doubt that £5 per annum would be deemed by them an ample return for the trouble of recording and transmitting the returns weekly to the central office. This arrangement would, of course, involve the supply of the necessary rain gauge to each observer.

It has been stated that if there was one paid station to every square of ten miles, or that if the paid stations were at a minimum distance of ten miles apart, it would suffice for all purposes, but this is not my belief. I consider that the distance between paid stations should not exceed a mean of five miles in the cultivated districts, and that the stations in the uncultivated and unprofitable districts should be fixed as near as circumstances would admit. The total area of the United Kingdom is 122,185 square miles, or 46,622,970 acres cultivated, and 30,571,463 uncultivated acres. If the base of information were determined to be one paid station to a square of ten miles, the number would be 1,222 stations, which at £5 per station would amount to £6,110 per annum. If the base were augmented to one paid station to every square of five miles of cultivated land, and one-fourth the number sufficed for uncultivated districts, the number would be 3,422 stations, and the cost £17,110 per annum. It is considered that by accepting the information of volunteers of a superior class, such as medical men, meteorologists, and other lovers of science, the number of observers might be readily increased, so as to meet local specialities of height, &c., if in return for the information so obtained the periodical publication of the registrar of rainfall was supplied to each correspondent.

The cost of rain gauges and fixing them may be estimated at 20s. each, taking as a basis the estimates of Mr. J. Wells and Messrs. Negretti and Co. The cost should be liquidated by annual instalments in the 20 years.

To maintain these gauges in working order (increased in expense by occasional changes of station and consequent damage), we must estimate the annual outlay at 5 per cent. of the first cost. To fix the gauges after the presiding authorities have determined the stations, would require the aid, first of the survey department of the Ordnance to ascertain the height of each station and connect the whole with the Ordnance datum; and next, of superior officials, initiated in meteorology, to see that the gauges are placed in a position free from the influence of trees and buildings, and in every respect in proper working order. The gauges, when fixed, would require periodical inspection by an authorised officer, about once every year, and this would necessitate the maintenance of a staff of travelling inspectors.

The class of men required for inspectors of rain-gauges would be practically the same as excisemen. It may be assumed that officers competent to perform the duties of excise supervisors would be equally capable of fixing and inspecting the gauges, and of instructing observers on the mode of recording, &c., when and where they themselves initiated in their duties: and it might possibly be found desirable that the present staff of excise officers should be increased, so as to undertake the work.

These several items of annual expenditure amount to £27,270, if five-mile stations be adopted; and to £12,920 if ten-mile stations be adopted. Thus:—

FOR FIVE-MILE STATIONS.		£
Registrar's salary and expense of central office		1,500
Printing.....		1,000
Annual payment to observers.....		17,110
Annual instalment to repay first cost and fixing of rain-gauges (7 per cent on £5,200)		375
Annual cost of maintaining the rain-gauges in working order		1,285
Annual payments to inspectors of rain-gauges...		5,000
		£26,270

FOR TEN MILE STATIONS.		£
Central office and printing		2,200
Observers		6,110
Annual charge for payment of first cost and of rain-gauges (7 per cent. on £2,100)		150
Cost of maintaining them		460
Inspectors		4,000
		£12,920

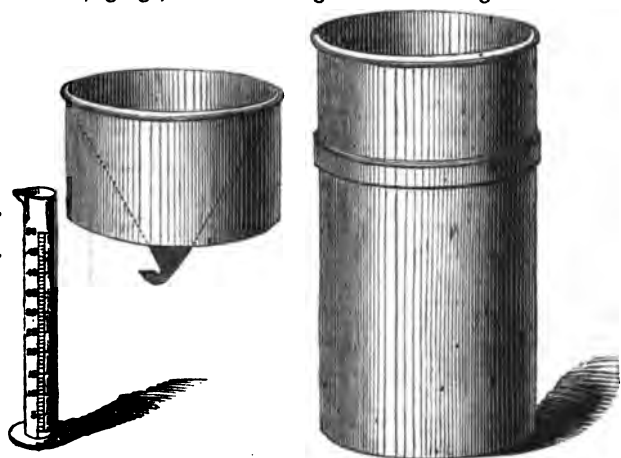
If the larger sum of the two were taken as the cost of obtaining an accurate and available return of the rainfall over the whole face of the country, it would result in a charge upon—

	£
England and Wales.....	15,000
Scotland	4,820
Ireland	6,200
British Isles	250
	£26,270

To represent this in a way that the country at large may be able to appreciate the extent to which they would individually subscribe, it should be stated that, to raise £26,270 on the rateable property of the United Kingdom, the charge would be one-tenth of a penny in the £1; or supposing the cost raised by county-rate, a person rated at £50 a-year, and paying 2½d. per annum for 20 years, would secure, for 4s. 2d., a perfect record of the supply of that element which contributes more than any other to the comforts and discomforts of man.

We must now refer to that important point, rain-gauges, if it be only to admit that much difference of opinion still exists as to the size of the gauge, and the height above ground at which it should be fixed, to gain the most accurate results.

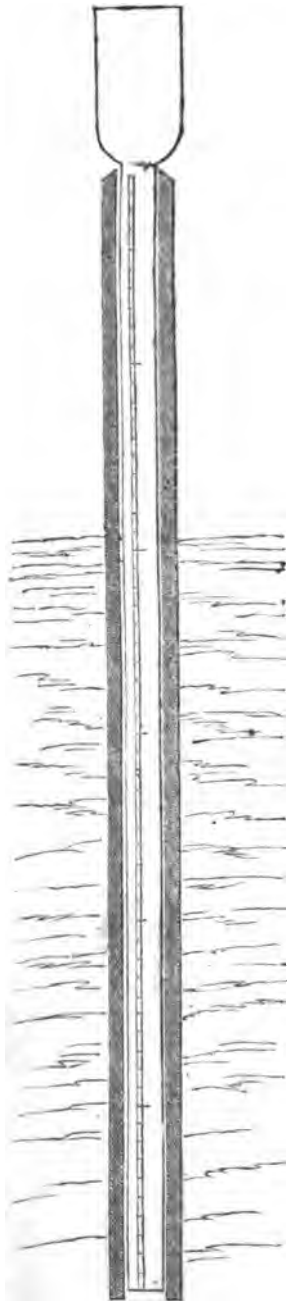
Mr. Glaisher, who is responsible in a great degree for the returns of the Registrar General, adopts the circular gauge, with a receiving surface about eight inches dia-



MR. GLAISHER'S GAUGE.

meter, so fixed as to be five inches above ground.—(See "Meteorology," by James Glaisher, 1857.)

Mr. J. Bennett Lawes, of Rothamstead, who for a long time has taken a great interest in the subject, and has compared the daily results given by a gauge of a size equal to 1/100th part of an acre with those of a small gauge five inches in diameter, has given it as his opinion that the larger the gauge the more accurate the return.—(See *Gardeners' Chronicle*, page 180, 1853.)

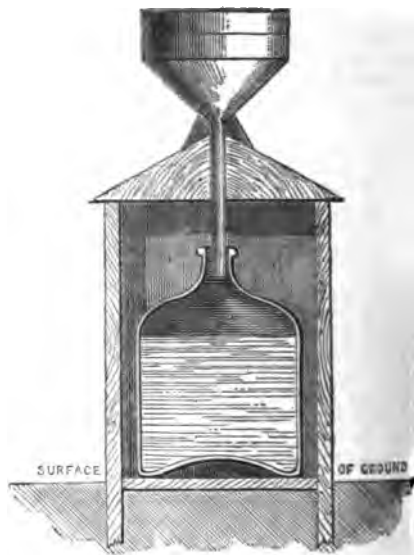


MR. STRATON'S GAUGE.

never, is directly opposed to the opinion of
of Aberdeen, who, after careful investiga-

tion, has given it as his opinion that circular glass gauges 1, 2, or 3 inches in diameter, placed 15 inches above the surface, are the best gauges that can be used. (See *Edinburgh New Philosophical Journal*, July, 1853.) and Mr. Welsh, of the Kew Observatory, states, in a note addressed to me, that he thinks "that there is much reason in what Mr. Straton says."

Mr. Homersham, in his report on the supply of water to Manchester, Salford, and Stockport (1848), has given the results of a series of experiments and records, which tend to shew that Mr. Glaisher's rain-gauges (to which he gives preference for some purposes) would not have answered in all cases.



MR. HOMERSHAM'S GAUGE.

These conflicting opinions upon the very instrument by which we should measure the rainfall, lead us to the conclusion that the first step to be adopted by the authorities by whom the general registration would be conducted, would be to determine the size and shape of the gauge, the height at which it should be placed under different circumstances, and the material of which it should be made. These points can only be determined by public authorities who have competent means of investigating them in a manner which no private individual can accomplish, and it would be no small gain to science if public necessity determined where errors have existed and in what way they may be avoided in future.

In conclusion, I must remark that I have approached the object of this evening's discussion with considerable diffidence. I have felt that the subject of rainfall was only one branch of a very comprehensive science, and that it was hardly possible to do justice to it without entering several kindred elements; and the time I have been able to devote to the subject, reduced as it has been to the closest limits, has been insufficient to allow me to do it justice even in its reduced shape. But I have been influenced by the conviction, forced on me by my daily practice as an agricultural engineer, that we are working in the dark, and I have wished, for my own sake and for the sake of those who are following the same pursuits, to rescue the present generation from the reprobum which must attach to it when its performances are tested by the experience and better data possessed by the next.

[illegible]

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[illegible]

HINXWORTH DRAINAGE.—RECORD OF THE MONTH OF MARCH, 1857.

[illegible]

Day of the Month.	Per Diem. Inches dec.	Per Acre. (Per Diem). In Gallons.	Height at the time of recording the Discharge should be observed, and the height recorded in time of day.	Barom. METEOR.	Rainfall.	OCCASIONAL DRAINAGE.—FIELD NO. 40.		PART UNUSUAL.		PART PARALLEL DRAINAGE.		CLOSE PARALLEL DRAINAGE.		TEMPERATURE.	
						16 Acres.—Silt, lower Chalk mixed with Clay Gravel, and Sand. Very wet before Draining.		10 Acres.—Silt, lower Chalk mixed with Clay Gravel, and Sand. Very wet before Draining.		10 Acres.—Silt, lower Chalk mixed with Clay Gravel, and Sand. Very wet before Draining.		10 Acres.—Silt, lower Chalk mixed with Clay Gravel, and Sand. Very wet before Draining.		At half past seven, a.m.	
						Observations on Test Holes, being the depth of free soil from surface of Land to surface of Water in the Holes, which are sunk midway between the occasional Drains. Test Holes 8 feet deep.	Quantity of Water from Outlet No. 8, which discharges the Drain Water from No. 12. Size of Pipe, five inches. Commenced running October 12.	Per Minute.	In Gallons (per Acre).	Per Minute.	In Gallons (per Acre).	Per Minute.	In Gallons (per Acre).	Per Minute.	In Gallons (per Acre).
1	0.30	1,131	29.37	...	...	Higher Side.— Distance from Drain to Drain 7 ft. Depth 6 in.	Lower Side.— Distance from Drain to Drain 33 yds. Depth 6 ft.	...	...	...	...	...	...	...	...
2	0.15	339	29.15	...	...	5 3	5 6	67	180	90	3 11	3 11	45	41	45
3	0.00	1,337	29.48	...	...	5 3	5 6	68	186	90	4 0	4 0	46	42	46
4	0.40	10,406	29.67	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
5	0.35	792	29.69	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
6	...	...	29.80	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
7	...	...	29.80	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
8	0.06	113	29.88	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
9	0.00	1,810	29.48	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
10	0.30	678	29.40	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
11	0.35	782	29.35	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
12	0.35	782	29.20	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
13	0.300	6,786	29.87	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
14	0.150	3,384	29.20	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
15	0.06	113	29.46	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
16	0.11	1,006	29.65	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
17	0.06	110	29.83	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
18	...	...	29.83	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
19	...	...	29.78	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
20	...	...	30.10	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
21	...	...	30.18	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
22	0.205	4,650	30.00	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
23	0.205	4,650	29.90	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
24	...	...	30.76	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
25	0.06	113	29.80	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
26	...	...	29.80	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
27	...	...	30.00	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
28	...	...	30.03	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
29	...	...	30.00	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
30	...	...	30.00	...	...	5 6	5 6	270	720	610	3 11	3 11	45	41	45
Total	1.440	32,586				Total quantity of water per acre discharged	Total quantity of water per acre discharged	6,683	10,920	10,920				6,186	
						Remainder unaccounted for	Remainder unaccounted for	25,903	21,666	21,666				26,398	
						Total Rainfall	Total Rainfall	32,586	32,586	32,586				32,586	

SUMMARY OF THE FOREGOING RECORDS.

RAINFALL.		QUANTITIES DISCHARGED FROM OUTLETS.				MONTHS.
	Per Acre. In Gallons.	From Outlet No. 7, from Oct. 1 to Feb. 28, and from Outlet No. 8 from March 1 to May 31 as per col. 7. Per Acre in galls.	From Outlet No. 9, as per col. 9. Per Acre in galls.	From Outlet No. 13, as per col. 11. Per Acre in galls.	From Outlet No. 15, as per col. 16. Per Acre in galls.	
1-845	37,215	12,910	178	8,915	Nil	October.
1-630	36,872	27,000	2,077	6,015	330	November.
1-233	27,935	30,565	11,895	15,935	5,825	December.
2-333	52,775	43,855	39,090	49,250	31,805	January.
1-192	4,343	27,360	14,320	13,650	9,060	February.
1-820	18,547	8,415	7,830	5,850	3,310	March.
1-440	32,586	6,683	10,920	10,530	6,188	April.
1-750	16,967	4,132	5,040	2,775	3,418	May.
10-045	227,240	160,920	91,350	112,920	59,936	Total discharge per Acre.
Between Rainfall and from the Drains ... }		66,320	135,890	114,320	167,384	
		227,240	227,240	227,240	227,240	Total Rainfall.

conducting the experiments and the results now collected, was first, to gain the proof of the draining capabilities of the soil, to demonstrate to what extent the system of drainage, so necessary for the improvement of the soil, may be profitably departed from in the case of an irregular character by the adoption of the system of drains. I selected the clay lands of the estate, as they presented a surface and subsoil, the nature of which was so forbidding as any clay lands I had ever seen. As a draining engineer, and as a landowner, I mixed soils were from their position and position cold at that season of the year—May—when a free and warm bed is necessary for the vegetation.

I reported on the drainage of the Hinxton estate to the owner, Mr. Clutterbuck, of who then contemplated some partial attempt the drainage in any other way than the system of drains, because I considered that nearly every acre of the estate was dependent on adjacent lands, and that the drainage could only be satisfactory and complete if the whole estate was altogether, and by a connected scheme of drainage. This suggestion Mr. Clutterbuck acted upon, and the estate is viewed geologically in its relation to the surrounding district, and the several parts of the estate are related to each other, I believe the value of the estate to deal with it as a whole will be fully

proved in 1855-6, Mr. Clutterbuck determined to drain the whole estate. It consists of three farms, containing about 800 acres. It lies at the base of the green-sand of the London Basin, and covers a large portion of the lowest bed of the chalk, the outcrop of which is visible, and a portion of the gault of the green-sand. In several parts a superficial deposit of sand and gravel overlies the older beds. The chalk from the gault is very soft, and is not in a distinct layer, would not extend to any depth in its thickest part. The siliceous character where it comes im-

mediately in contact with the greensand. It has also imbibed a calcareous quality by an infiltration of the chalk through the greensand into its bed; for a wide breadth, however, the gault is denuded, and there, although the greensand is absent, a very considerable infiltration of lime has taken place, which, I presume, may be accounted for by the fact, that the chalk escarpment rises in almost cliff-like shape immediately at the margin of the gault, and any submersion of the gault has necessarily imparted to it the character of its more prominent and overwhelming neighbour.

The following are several analyses of Professor Way:—

OF THE LOWER CHALK AND MIXED DRIFT.

Moisture and organic matter	3.27
Sands and clays	24.37
Silica soluble in acids	1.23
Oxide of iron	1.14
Phosphate of lime	0.92
Sulphate of lime	0.76
Carbonate of lime	68.31
	100.0

OF THE GAULT (AT 24 INCHES DEEP.)

Moisture and organic matter	5.01
Sands	0.66
Clay	63.26
Carbonate of lime	31.07
	100.0

OF THE GAULT (AT 42 INCHES DEEP.)

Moisture and organic matter	4.28
Sands	0.34
Clay	62.97
Carbonate of lime	32.41
	100.0

of the temperature; and therefore, in estimating the temperature, as much drainage had become essential, and was recommended; and the practical result was, that the temperature had been

Mr. Denton remarked, that Mr. Denton's accurate knowledge of the rainfall was actually necessary for the purpose; but during a storm an inrush might fall, and that contingency of drainage, in order to allow the surplus to run out of the land. In his own rainfall had not so much to do in some people seemed to imagine, it might be laid in such a manner as to collect the immense body of water that fell upon the land. It had been stated that a depth of two feet was beyond the reach of his own part, in his fields, he should estimate the stratum to be less than $3\frac{1}{2}$ inches; he should be in fear that the temperature would be greatly lowered.

MR. F.R.S., said, he thought the question put the real question for consideration. Mr. Webster did not regard it of so much importance as to know precisely the quantity of rain that fell, and the observations already made in the country, and might, he thought, be contained in the valuable tables published by the Ordnance Survey, which were included the record of the rainfall which fell in almost every place in the country. Professor Lloyd had also published tables in Ireland, obtained from persons in the coastguard service, and in those compared with the west, gave results of observations made in England. In the question, regard must be had to the district—first, as to level; secondly, as to whether east or west; thirdly, inclination; and fourthly, nature of the strata. He apprehended, if given, knowing the amount of rainfall, it would tell what would be the amount of outflow, and provide for artificial drainage. These questions belonging to the agricultural drainage could only be solved by those who had a knowledge of the various localities. Therefore, the establishment of observations by paid observers would be worth the expense, for, as regarded the distribution of rain, the quantity varied within two or three inches, but how it varied with was so much a matter for individual consideration that they must look to those interested in the result with it. The remark of Mr. Greaves was an important one, viz., that only one-fifth of the rain went to feed the springs, and that four-fifths was lost by evaporation. He had often considered the accuracy of the test of evaporation might be obtained, but he thought the notion of the cube yard was an extremely valuable one. With regard to rain gauges, he recollected that when Mr. Lloyd read a paper on the subject before the Association at Belfast, some advocated a spherical gauge, as it was argued that by this means which the wind blew the entire rainfall was registered. The variation of the various gauges might, however, be made. With regard to the easterly and westerly winds mentioned by Mr. Clutterbuck, the rain during a storm was due almost entirely to the condensation consequent upon the cold and dry wind coming from the north. Therefore, when they had a fall of rain from the north, the quantity absorbed by evaporation was compared with that evaporated from the south. This would account for the occurrence of floods which had been men-

Mr. ROBERT RAWLINSON said that civil engineers fully recognised the use of the rain-gauge, and he (Mr. Rawlinson) agreed with Mr. Webster in thinking Mr. Denton had rather underrated the value of existing records as to rainfall, returns having been published which were easily accessible for England, Scotland, and Ireland. To establish a national system of rain-gaugings must be very costly, and the results would only be useful to a limited extent. A national survey was useful, but it would not prevent the necessity for special surveys for special purposes. No nation could do the work of individuals, nor ever would do such work. With respect to the fall of rain, as connected with town sewerage and land drainage, registration of volume was only useful to a limited extent. No engineer could deal with maximums, as the excesses could not be reserved in either sewers or drains, but must pass away in a natural manner over the surface. From careful registration and from tolerably accurate gaugings of volume at outfalls, in one case over an area of steep mountain district rising more than a thousand feet, and in a second case from a tolerably flat and porous soil and subsoil, it was found that the maximums in both cases were almost identical, and that these maximums, as compared with the minimum flow, reached almost every year as high as 800 to 1, and occasionally even to 400 for short intervals; that is, a natural stream having one gallon per minute flowing down during a continuance of dry weather, had, in its annual floods, three hundred gallons in a similar time; and, at longer intervals, even up to four hundred gallons. This, he believed, would be found, more or less, to be the case throughout Great Britain, whether the annual rainfall was 20 inches or 40 inches—as the district of least annual fall might have thunderstorms of short duration, but heavier than any which took place in a locality where the rain fell in a greater number of days. The engineer should pay especial attention to excesses of rain and to flood outfalls, and he would find that he could not deal with such vast volumes of water either in sewers or in drains. The Ouse at York, and the Eden at Carlisle, had each a flood rise upwards of 20 feet in vertical height, and vast areas of valley land were covered at such times. Then, as to the work sewers and drains had to do, the subsoil water must be taken into account, and this would be found greater than was generally imagined. The contemplated low level intercepting sewers for metropolitan sewerage, if ever made, would, in his opinion, actually be filled permanently with subsoil or spring water. Rivers were the natural drains of a country, both for surface and for subsoil. The banks of the Thames were full of springs, and much of the subsoil was quicksand. Brick sewers would admit the water, and not unfrequently the fine sand. The mischief and danger of large and deep sewers in such strata, could hardly be overrated. The excessive volume of spring water would remain to be pumped, where there was no natural outlet—that is, below ordinary low water. In several towns in which public sewers had been carried out, the flow, during dry seasons, had been gauged, and the excesses of surface and of subsoil-water found in the sewers at such times were, in one case, five to one, and, in a second case, nine to one—that is, the sewage due to water supply was taken as one, and the subsoil-water and surface-water, at the driest times, five and nine. In both these cases there was a natural outfall. At Worthing, where the whole of the sewage and subsoil-water had to be pumped, the excess of subsoil-water was even greater. English engineers were now engaged in all parts of the world, and a knowledge of the laws of nature was indispensable to prevent fatal blunders. If, in Great Britain, maximums of floods up to 400 should be provided for, in the tropics maximums of thousands must be anticipated. There were natural phenomena to be observed, which might teach the engineer at a glance what he ought to expect, such as dry ravines, full of the evidences of water bare sides of mountains, and the absence or presence

The whole of the [unclear] character and those [unclear] from excessive wetness each standing within the spring months of [unclear] connected system of [unclear] mixed drift soils were [unclear] parallel drains (from [unclear] charge the rainfall [unclear] terranean water pass [unclear] grounds to their [unclear] £1 10s. to £3 10s. [unclear] drained uniformly [unclear] 25 and 27 feet apart [unclear] £5 10s. to £6 10s. [unclear] modes of draining [unclear] description of soil, [unclear] standing in the test [unclear] and 13. The dis- [unclear] ing rain is exhib- [unclear] will be observed [unclear] was much more [unclear] latter gave out a [unclear] immediately after [unclear] of the influence [unclear] through soil to the [unclear] fact, that all the [unclear] of water on the [unclear] out any fall of [unclear] each occasion the [unclear] meter had taken [unclear] hours.

The Rev. J [unclear] as to the impor- [unclear] phenomena. [unclear] ment of rainfa- [unclear] his grandfather [unclear] Clutterbuck, a [unclear] of rainfall [unclear] Mr. Clutter- [unclear] way in which [unclear] paratus, as a [unclear] observations [unclear] accurate reg- [unclear] the wind, w [unclear] moment at [unclear] not unfrequ- [unclear] of keeping a [unclear] solute and [unclear] mention in [unclear] had been [unclear] and his [unclear] a peculiar [unclear] regulated [unclear] guage. [unclear] practical [unclear] rainfalls. [unclear] river The [unclear] water de [unclear] of the ra [unclear] was rain [unclear] That w [unclear] fall of [unclear] Living [unclear] was the [unclear] such la [unclear] cause is [unclear] from the [unclear] had ob [unclear] hardly [unclear] sidered [unclear] guages

country, yet the consideration of the subject by this Society, and the valuable observations offered during the present discussion, would tend to arouse the attention of agriculturists, engineers, and of the public generally, and lead us, he hoped, to the further perfecting the arrangements now pursued by the Meteorological Society and others. He begged to propose a vote of thanks to Mr. Denton for his extremely interesting valuable paper.

A vote of thanks was then passed to Mr. Denton. Mr. DENTON, having acknowledged the compliment, said—In the first place he would state that the omissions in the plan alluded to by the chairman were entirely owing to the fact that he could not find those places on a map, and could not obtain sufficient information to enable him to put them upon the plan with authority. The map showed, by dots, every station in England recognised as authoritative, which amounted to 120 towns, and these, he submitted, were as nothing compared with the number they ought to have. The variation from land must depend upon whether there is a vent below, that acted as a means of discharge, by which the water might flow out of the soil as soon as it rained into it. If drains existed below, they removed a quantity of the rain as it fell, and by that means checked, if not entirely prevented, evaporation. If there was no drainage below, the soil was kept in a saturated state until evaporation released the water. Therefore, to arrive at a result, without taking into consideration both these circumstances, was not fair reasoning. Questions were asked as to the depth and distance of drains should be dug under varying circumstances of rainfall. He (Mr. Denton) had already stated that he had before them this glaring fact, that upon soils of precisely the same mechanical and geological formation, for instance, the lias, running from north to south—in some places they had 37 inches and in others less, and the number of days of rain would vary considerably. He would put it to those present whether the fact must not have a direct influence upon the usage of the land—a difference of 16 inches in the rainfall, or equal to the entire rainfall of Essex; and it seemed to all reason to suppose that so great a difference as 1,600 tons of water falling on the surface must not have a considerable effect. It could not be expected to treat the two instances in the same way.

The Secretary announced that on Wednesday evening next, the 20th inst., a paper by Mr. William Clay, "On the Manufacture of Puddled Wrought Steel, with an Account of some of the Uses to which it has been Applied," would be

SOUTH KENSINGTON MUSEUM.

During the week ending 9th January, 1868, the following have been as follows:—On Monday, Tuesday, and Wednesday (free days), 3,489; on Monday, and Tuesday (free evenings), 2,528. On the three students' days (admission to the public 6d.), 635. One students' evening, Wednesday, 85. Total, 6,687.

Home Correspondence.

MR. UNDERWOOD'S PAPER ON INK.

I am permitted to make a few remarks on Mr. Underwood's paper on inks. Having had considerable experience in this manufacture, I am well acquainted with its difficulties. From my numerous experiments I am convinced that it is not from any solution of the problem that an advance and improvement in

the manufacture of ink can be made. Logwood, and extract of logwood, has long been used, in all proportions, with gall nuts, metallic iron, and iron salts. The more logwood, the commoner and cheaper the ink, such as school ink, &c. Now, how a patent can be claimed for any such combination in any proportion whatever, I cannot conceive. The principal feature of Mr. Underwood's paper, viz., the use of "chromate of potassa," your correspondent Mr. B. Winstone has justly observed was invented by Professor Runge. The recipe, just as Mr. Winstone has quoted it, was copied into all the cheap journals of the day, viz., some four or five years ago, and recommended as a very cheap ink for steel pens. A German got hold of it, and went about London among the stationers selling the recipe; many were victimised, as the product was worthless. I have some writing in my possession with this ink, carefully prepared, and it has quite faded, as might be expected. He also stated that he saturated copying paper with the chromate salt, and wrote with logwood solution. In the discussion which took place, Mr. May justly questioned the durability of any compound of logwood. Mr. Deputy Lott seemed to think if its indelible character could be proved, it would be valuable to the legal profession. No doubt an indelible ink would be, but certainly any logwood ink would be dangerous to rely upon. The only real scientific advance in this manufacture was made by the celebrated chemist Berzelius, from the rare metal "Vanadium;" this is, unfortunately, so scarce as to preclude its use for this purpose. It was stated to be indelible. The chemical action of chromate of potassa upon solutions of logwood, is an oxidising one. The colouring principle of this wood was first extracted and investigated by Chevreul, the French chemist; it is termed "Hematoxylin," and deposits in brownish-yellow prismatic crystals. By contact with air or oxidising agents, it is converted into "Hematin," which is granular and of a purplish black hue, and this is what is produced on the copying paper saturated with the chromate salt, when placed in contact with logwood ink. Very common inks are made with large proportions of logwood, or extract of logwood, from the fact of their being produced at about 4d. per gallon—very small quantities of iron salts being requisite. The chromate ink of Runge is still cheaper. I am now engaged with experiments on indelible ink, and trust some future day to lay the results before the Society, as the subject is one of some importance.

I am, &c.,

ROBERT PINKNEY.

18, Broad street Hill, E.C., Jan. 11, 1868.

Proceedings of Institutions.

CROSBY-HALL.—EVENING CLASSES FOR YOUNG MEN.—On the 7th Jan. a lecture was given by S. C. Hall, Esq., F.S.A., Editor of the *Art Journal*, and the author (with Mrs. S. C. Hall) of "Ireland: its Scenery and Character." The subject of the lecture was "The Fairy Legends of Ireland." The purpose of the lecturer was to amuse rather than instruct, although his lecture contained much information concerning Ireland, and especially those local peculiarities which are rapidly fading away before the advance of education. The fairy legends of that country are now to be found only in books, or in the memories of those who gathered them long ago; so it is, indeed, although to a less limited extent, with the almost proverbial wit and humour of the Irish peasantry. The lecture was enlivened by many illustrative and characteristic anecdotes. The following is the syllabus of the lecture:—"Universality of faith in Fairies—The essentially poetical character of Irish Fairies—Their meeting places, &c.—Fairy chieftains—The Phooka—the fiend spirit of the Morass

story of Daniel O'Rourke and the Aigle. The Banshee. The White Lady of Sorrow. The Cleuricaune—The Irish treasure-keeper. The Dulla-haun—Spirits without heads—Perils of Ned Sheehy—The Thierna-naoge—The land of perpetual youth—Stories of Ossian's white cows, and the holy monk of Aghadoe. The Hy-Brasil—The Isles of the blest. The Merrow—the Irish Mermaid—Story of John of the Glyn. Monastic Legends—Glendalough—How St. Kevin got rid of the last of the Serpents. Illustrative Anecdotes of the humour and pathos of the Irish character—Irish Bulls—Irish Brogue—Irish Beggars, Waiters, Car Drivers, &c.—The over-ready wit of the Irish peasantry. Summary of the high capabilities for good of the Irish people. Impressions of the lecturer regarding Ireland as resulting from frequent visits, and from journeys through many of the high-ways and by-ways of the country."

BIRMINGHAM.—On Monday evening the 11th inst., a lecture was delivered at the Midland Institute, by the Rev. C. P. Wilbraham, a friend of the President, Lord Hatherton. Having seen a good deal of the world, chiefly while an officer in the army, the reverend gentleman entertained a numerous audience for nearly two hours, as he told of his "adventures in four quarters of the globe." The lecture was a pleasant bit of instructive gossip.

MEETINGS FOR THE ENSUING WEEK.

- TUES.** Royal Inst., 3. Prof. Huxley, "On Vital Phenomena." Civil Engineers, 8. Discussion upon Mons. Guérin's Paper "On Railway Brakes," and Mr. T. S. Sawyer, "On self-acting Tools for the Manufacture of Engines and Boilers." Pathological, 8. Col. Sykes, M.P., "On Public Works in India."
- WED.** Royal Soc. Lit., 4½. Society of Arts, 8. Mr. William Clay, of the Mersey Steel and Ironworks, Liverpool, "On the Manufacture of Puddled and Wrought Steel, with an Account of some of the Uses to which it has been applied." Geological, 8. I. Dr. C. Daubeny, "On the Emission of Ammonia from Volcanoes." II. Rev. Prof. S. Haughton, "On some of the Granites of Ireland." III. Dr. J. J. Bigsby, "On the Classification and Stratigraphy of the Palaeozoic Rocks of the state of New York."
- THURS.** Royal Inst., 3. Prof. Tyndall, "On Heat, considered as a mode of Motion." Philosophical Club, 5½. Antiquaries, 8. Chemical, 8. I. Dr. Gladstone, "On the Mutual Reaction of Salts in Solution." II. Dr. Noad, "On the Chemical Differences of hot and cold Blast Iron." III. Dr. Bird Herapath, "On the Iodo-sulphates of the Cinchona Alkaloids." Linnaean, 8. Prof. Huxley, "Memoir on the Organic Reproduction of Aphids." Philological, 8. Royal, 8½.
- FRI.** Royal Inst., 8½. Prof. Tyndall, "On some Physical Properties of Ice."
- SAT.** Royal Inst., 3. Mr. Bloxam, "On the Chemistry of the Air." Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Jan. 8, 1868.]

- Dated 5th November, 1867.**
2906. Godwin Ratler Simpson and David Caldwell Simpson, No. 79, High-street, Whitechapel, and No. 5, George-terrace, Commercial-road—Improvements in spring blinds.
- Dated 19th November, 1867.**
2906. Philip Edward Coffey, Bromley, Middlesex—An improvement in the process of distilling.
- Dated 16th December, 1867.**
2903. James Thornton, Nottingham—Improvements in apparatus used for the manufacture of carpets and other cut pile fabrics.

Dated 18th December, 1867.

3114. Robert Oxland, Plymouth—Improvements in the manufacture of alloys or compounds containing metallic tungsten. (A communication.)
- Dated 19th December, 1867.**
3116. Asa Lees and John Clegg, Soho Iron-works, Greenacres Mead, near Oldham, Lancaster—Certain improvements in looms for weaving.
3118. Richard Furnival, Manchester—Certain improvements in machinery or apparatus for cutting paper, cardboard, and other similar articles.
3120. Richard Archibald Brooman, 166, Fleet-street—Improvements in signalling, in order to prevent collisions between trains upon railways. (A communication.)
3122. John Bartlett, Bristol—An improvement in weighing-machines.
- Dated 21st December, 1867.**
3128. James Hamilton, Liverpool—Improvements in ship building.
3130. Robert Henrie, Netherwood, Dumbarton—Improvements in self-acting trap doors for mines.
3134. James Tatlow and Henry Hodgkinson, Wirksworth, Derby—Improvements in railway breaks, and in apparatuses for connecting shafts or rods for working breaks and signals.
3135. William Barford, No. 15, Lowther-cottages, Liverpool-road, Lisleigh—Improvements in the manufacture of gas, and in retorts and other apparatus to be used therein.
3138. Richard Ford Sturges, Birmingham—A new or improved manufacture of rollers or cylinders for printing fabrics.
- Dated 22nd December, 1867.**
3140. Samuel Rodgett and Daniel Rodgett, Blackburn—An improved method of coupling and uncoupling railway, tramway, and other carriages, waggons, lorries, trucks, and other vehicles.
3142. Morris London, 25, Fudding-lane—Improvements in cooking utensils.
3144. Edwin Maw, Doncaster Iron-works, Yorkshire—Improvements in ornamenting and strengthening metal tubes and rods with wood, applicable in the manufacture of bedsteads and other articles of furniture and framings, and also in the manufacture of the joints or connections of the posts and framings of bedsteads and other articles of furniture and frames.
- Dated 23rd December, 1867.**
3150. Augustus Frederick Kynaston, R.N., Plymouth—An improved slip or disengaging hook.
3152. John Murray, Whitehall-place—Improvements in propelling ships and vessels. (A communication.)
3154. Alexander William Williamson, 16, Provost-road, Haverstock-hill—Improvements in treating scammony root and commercial scammony, to obtain the active principle therefrom.

WEEKLY LIST OF PATENTS SEALED.

- January 8th.**
892. Wm. Edmondson Jones.
893. John Talbot Pittman.
895. Thomas Frederick Henley.
938. François Burot.
940. Murdoch McKay and Henry Forth Osman.
962. William Henry Gauntlett.
2006. Joseph Conway.
2010. Frederick Warner.
2032. William Johnson.
2046. George Tomlinson Bousfield.
2052. Octavius Henry Smith.
2104. John Elce and John Leech.
2160. George Tomlinson Bousfield.
2274. George Tomlinson Bousfield.
2616. Thomas Bell.
2462. Frances Windhausen.
2776. Joseph Fry.
- January 12th.**
1941. Henry Starr.
1913. Nicholas Williams and Thomas Williams.
1954. Henry Hebblethwaite, William Shuttleworth, and William Tasker.
1856. Wm. Stettinius Clark.
1939. Gustavus Palmer Harding.
1963. François Moulin.
1984. William John Leck.
1972. Wright Jones.
1973. James Wright.
1974. John Cox.
1877. George Samuel Mathew.
1986. Thomas Clunes and John Mackintosh.
1988. Thomas Roberts and John Dale.
2005. Henry Vanner Cowham.
2017. George Kirby.
2054. George Tomlinson Bousfield.
2063. Thomas Forayth.
2149. William Edward Newton.
2185. William Edward Newton.
2118. Archibald Turner.
2460. William Edward Newton.
2583. Thomas Massey & Thomas Savage.
2739. Thomas Richardson and Manning Prentice.
2661. Thomas Massey & Thomas Savage.
2674. William Edward Newton.
2697. Thomas Cardwell.
2731. Abner West.
2757. William Clark.
2883. Solomon P. Smith.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

- January 4th.**
31. Robert Ashworth & Samuel Stott.
- January 6th.**
42. William Grindley Craig.
99. John Charles Pearce.
123. David Davidson.
- January 7th.**
66. Henry Bessemer.
- January 8th.**
71. John Norton.
- January 9th.**
63. William Thomas Henley.
89. William Birmingham.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4943	Jan. 9.	Ballast or Shovel Hoe	John Gordon	3, Railway-pl., Fenchurch-st.

Journal of the Society of Arts.

FRIDAY, JANUARY 22, 1858.

PRIZE FINANCIAL ESSAY.

Essays bearing the following mottoes have been received by the Secretary :—

Métal Precieux.

Carpe diem.

X^a.

Virtus sola invicta.

E.C.S.

Counting the Cost.

Debitum Solvendum.

Labore et Fiducia.

Pecunia obediunt omnia.

Ubique.

Great is truth, and it prevails.

Publicus.

It is never too late to mend.

Mancant nostros ea fata Nepotes.

Finem respice.

"If thou desirest to know the value of a guinea, go and try to borrow one."

Financier.

When gold speaks, all tongues are silent.

Johannes.

Simplicity is strength.

Euston.

"Theories ruin nations; follies individuals."

EXAMINATIONS.

DRAWING (HUDDERSFIELD, 1857).

The Council have awarded prizes of books to Wainman Topham, Bradford Mechanics' Institution, and Robert Wilson, Lincoln Mechanics' Institution.

NEW ZEALAND FLAX.

It will be in the recollection of Members that allusion was made in the Chairman's address* at the opening of the present Session, to the offer lately made by the New Zealand Government of prizes for encouraging the production of New Zealand Flax, of which notice had previously been published in the Society's *Journal*.† The following communications in reference to this subject have just been received from the Colonial Secretary in New Zealand :—

Colonial Secretary's Office, Auckland, Sept. 16, 1857.

SIR,—I have the honour to transmit to you the enclosed notices, as in the margin,‡ offering rewards to the amount of £4,000 by the Government of New Zealand, for the discovery of efficient means for rendering the flax and other fibrous plants of New Zealand available as articles of export.

I have also to inform you that a box, the freight of which has been paid, and the bill of lading of which is enclosed, has been forwarded to your address by the *Kaitiworth*, containing the samples of flax referred to in the accompanying extracts of letters received from the gentlemen named in the margin,|| and a further sample

from Mr. Wastney,* of Nelson, with respect to which no particular observations have been furnished.

The Government of New Zealand is very anxious that every publicity should be given to its desire to promote, by these rewards, or in such other way as may appear advisable, the profitable exportation of the *Phormium Tenax* and other fibrous plants of New Zealand, and will be happy to co-operate with the Society of Arts in any manner which the Society may suggest for the attainment of that object.

For further information on this subject I beg to refer you to H. Sewell, Esq.,† a member of the Executive Council of this Colony, now in England, whose present address is given below.

I have the honour to be, Sir,

Your very obedient servant,

E. W. STAFFORD.

The Secretary of the Society of Arts, Adelphi, London.

The following are the notices referred to in the foregoing letter :—

Colonial Secretary's Office, Auckland, December 20th, 1857.

The Government of New Zealand is prepared, subject to the undermentioned conditions, to give rewards to the amount of £4000, for the discovery of efficient means for rendering the flax, and other fibrous plants of New Zealand, available as articles of export, viz. :—

£2000

To the person who shall, by some process of his own invention, first produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, one hundred tons of merchandise.

£1000

To any person, other than the person entitled to the first reward, who shall, by some process of his own invention, next produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, one hundred tons of merchandise.

£1000

Viz. :—£200 to each of the first five persons, other than those entitled to the first and second rewards, who shall by any process, whether of his own invention or not, produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, twenty-five tons of merchandise.

The merchandise must be saleable as an article of export from the colony of New Zealand, and have been produced at a cost not exceeding 75 percent. of its value at the port of entry from which it is exported; and the process must be fully made known with a view to the discovery being at once made available to the public.

His Excellency the Governor of New Zealand will from time to time appoint commissions, to consist of not less than three persons, to act at such places as circumstances may require, and each claim for reward will be referred to such commission as may be considered the most convenient for its proper investigation. The acts of the majority will be deemed the acts of the commission.

Each commission shall be at liberty to adopt such means as it may deem most fit for determining the value and cost of production of the merchandise, for ascertaining the process employed, and for fully investigating in all respects, and reporting upon the validity of any claim.

Every claim for reward must be preferred in writing, before the 1st January, 1859, to the principal officer of Customs at the port of entry nearest to the place where it is desired that the examination of the merchandise shall take place, who will at once proceed to ascertain whether the full quantity, in respect of which the reward is claimed, is ready for examination, and if such quantity is ready, he will give a certificate to that effect, dated on

* See *Journal*, Vol. VI., p. 3.† See *Journal*, Vol. V., p. 328.

‡ See next col.

|| Rev. Jas. Preece, Baron de Thierry, Mr. M. Whytlaw.

* In error marked on the specimen as Mr. McGlashan.

† H. Sewell, Esq., care of the Rev. Wm. Elwyn, Worsley Vicarage, Carlton, Cambridgeshire.

made at the rate of 120 lbs. of converted flax per hour, the flax being weighed after being washed and dried. But the casks were of oak, and a stage was raised about a foot and a half in the interior with billets of firewood, to keep the leaves from touching the water distilled in the process of steaming. With sufficient steam for steaming, and with sufficient water for the water wheel, I could have made flax for sale at £15 per ton at a large profit. The colouring matter of the oak and firewood coloured the flax, as may be seen by No. 5, and yet so superficial was the colouring, that by my cleansing process, which I term the "secondary process," I have, with no other agency than water, brought the same flax to what it is in No. 3—which merchants of Auckland say is the best flax ever produced in this market. I found, too, that the deep red of the lower end of the leaves, if cut down to the bulb, yielded a colouring matter which diffused through the flax by the steam, as is shown in No. 4. To guard against these things, it is only requisite to construct the steam chambers of white wood, and to cut the leaves about a foot above the bulb; the steamed flax will be of a pale green, and after cleansing will be quite white. The efficiency of my method of applying the secondary (water) process, may be seen by No. 2. No. 1 was flax of the finest *Tihore* kind, scraped, by desire of the resident missionary at Coromandel, by natives; it smells sickly, and gradually grows darker by keeping, as the gum, which nourishes the fibre when growing, and is its bane when cut—discolours and corrodes it. No. 2 is the same flax, having undergone my cleansing or depurating process, without any other agent than water; the fibres are separating, and every day it becomes whiter and finer, because the gum is no longer there. The gummy flax is hard, and springs after being compressed, whilst the gumless flax retains the form given it without springing, and can be compressed into nearly half the bulk. All steamed flax will bear the sea without heating or becoming musty, because what portion of gum remains becomes inactive, but the gumless flax is by far the most valuable as an export, because it is ready for immediate use, and can, by heckling, be brought, without new machinery and without chemicals, to any degree of fineness.

A very erroneous impression exists about the native flax. It has been represented as stronger than European hemp, but it is not so. Whilst the strands of fibres are held together by the gum, in a yet fresh state, the strength of these strands, collected together into a rope, is amazing. By age and exposure it becomes acrid, and corrodes the fibre, and renders the rope weak and brittle, as is proved by the native baskets or kits, which are of great strength when fresh, and break to pieces when dry and old. So powerful is the effect of the gum upon the fibres, that in a few days after being cut, the leaf rolls up like a rod, and becomes brittle as straw, scarcely any trace of fibre remaining when quite dry.

To reduce the amount of labour as much as possible, rather than to seek a better method, I have dispensed with beating. I find that with rollers, of my own construction, I can turn out more flax at less cost. I have, by renewed exertions, arrived at three important results, the production of a first-rate merchandise, at the low price of £14 per ton (including purchase of leaves), rapidity of production, and freedom from gum. Flax which will not deteriorate under ordinary circumstances, which will not heat, and which requires no additional expense to be made available to the European consumer.

Without dwelling upon idle wranglings about the relative strength of European and New Zealand flax, it must be obvious that as a far greater quantity of *Phormium tenax* could be grown in New Zealand than cotton in the United States, a most important fact presents itself,—the fact that as flax may be made gumless, and may be applied to a multitude of fresh uses, it is well calculated to develop new means of wealth to the mother country. When flax shall be cultivated, the finer sorts

need cost no more in New Zealand than the coarser, and though all kinds are valuable, and though all can be made at a large profit, the largest return will be realised by the finest quality. In the event of a war with cotton-producing countries, Great Britain might be materially relieved by this hitherto costly colony. Inspection of the gumless flax will satisfy any experienced person of its adaptability to making excellent linen, and to be woven with cotton or wool into a valuable union cloth.

Although the appearance of No. 2 is so much brighter than No. 3, the close observer will find that, allowing something for the difference in the quality of the plant, the fibre of No. 3 is very little inferior to No. 2. When worked up, there will be but a trifling difference, which shows that, with similar leaves, a superior result to the native scraped will be obtained by steaming, a result the more evident, as everyone must see that No. 2 is superior to No. 1, and that I greatly improve the market and physical condition of the native scraped. The natives cannot make flax to remain unchanged or white, however much they may wash and pound it. In proof of this, I need but call attention to the finest mats they make, which are never whiter than straw-colour, and always darken with age.

The Ti.

The flax from the *Ti* is my own discovery, and I believe that competent judges in Europe will bear me out in the assertion that it is finer and stronger than the *Phormium tenax*. The sample which I send was simply beat out and washed, and the accompanying specimen of the same material, prepared *chemically* by one of our townsmen, will show how exquisitely fine the fibres will separate. I never resort to chemicals, nor do I wish to employ them, for they must always prove expensive. This flax (such as my own sample) could be sold at about £12 per ton, whilst Mr. Hornby assures me he could not make his for less than £40. The question is, of course, which would be the most remunerative? When chemicals must be used, I would be in favour of sending the fibre to England in its raw stage. The very plea of economy would induce me to advocate the prudence of ridding the *Phormium tenax* of its gum before shipment from this country. Water is as cheap in New Zealand as in Europe, and as water alone is needed in my cleansing (or secondary process), and as little manual labour is required, which little is fully balanced by the reduced bulk and lessened freight, I could see no reason for sending an unsound perishable material to Europe, when a sound and improving staple can be furnished at the same cost. I believe the *Ti* will be found applicable to the finest textures, from lace downwards.

The *Ti* is a tree which grows as high as 20 to 30 feet, and the flax is the product of the leaves, which are about three feet long, and from $\frac{1}{4}$ ths of an inch to an inch wide. The whole tree is of a stringy nature. It is very hardy, and cuttings upwards of 6 inches in diameter will take root in moist land. It grows in swamps where nothing else will stand; it makes an impenetrable live fence; it grows either in or out of water, and prospers upon the highest hill and in the deepest gully.

I avail myself of this unexpected opportunity to express an opinion that the rule of the government, not to interfere with private enterprise, might be with great advantage departed from as relates to the *Phormium tenax* and *Ti*. Governor Fitzroy made a most praiseworthy attempt at manufacturing woollens, and it is much to be deplored that he did not persevere. A Governor clad in homespun would have been a glorious event for a young colony like this. Nothing would work out the great problem of the civilization and humanising of the native race so effectually as working upon their ruling passion, and proving to them the large profit to be derived from the manufacture, by a rapid process, of the flaxes which abound in their country.

powerful flax mill, established by the Government, in which natives would be received and taught the easily-acquired art of flax making, would induce them to introduce that industry into their many fine flour mills, and would diffuse wealth throughout a land so depressed as this at the present time.

I say nothing of the medicinal properties of the *Phormium tenax*, as they have to be tested in a regular way. The natives make much use of it for their horses and for themselves. The gum may be the chemical agent, but of neither the gum nor the juices can I say more than that there is every reason to believe they will be found very valuable. I can save both, and it appears to me that the inquiry would be well worth the attention of Government.

The *Government Gazette* of December 24, 1856, contains an offer of £4,000 as rewards for discoveries in flax-making. I must take the liberty to observe that the Auckland Chamber of Commerce did not, in my humble opinion, give the subject the wide scope which it seemed to demand. I think more justice and more good service would have been done if a single reward of £2,000 had been offered, and that a reward had been held out to persons planting a certain quantity of flax and 7 $\frac{1}{2}$ %. Large plantations would necessitate flax-making, and would stamp the value of the export. I think, too, that discoverers should be rewarded without reference to manufacturing, as the one should be separate from the other. I mean, of course, those persons who should discover new fibres capable of giving increased wealth to the colony. The discoverer of an available gold field would not be compelled to be a digger in order to earn his reward. I think, moreover, that instead of the minor rewards, it would have been better to promise a bounty of £5 per ton upon the 200 tons shipped under the published reservations; it would have been more likely to spur the poor man as well as the rich one to exertion.

I would wish to see the opening of a scientific Commission, under the immediate observation of the Governor, into the different modes of making flax; into the cause of the failures which have been so fatal to the best interests of the colony; into the most promising and available system of making flax, and into the advantages to be derived by each system by the home and colonial interests. Witnesses to be examined separately and upon oath. And I would gladly see the result become the basis of prospective reward, the Government, or rather the Government Commission, declaring the name of the most successful candidate, or the candidate to whose plan it might appear that most confidence might be given, but in forming a commission I would scrupulously avoid appointing any member who could be suspected of bias—none but flax-makers to be examined, in order that a practical result should be obtained.

I trust I shall be forgiven the perhaps unreasonable length of this paper—a subject of such vital importance should not be treated with levity. The worth of many millions sterling surrounds us, and as we may some day be called upon to meet extraordinary demands and expenses for which we are ill prepared, we must look upon the development of the resources of the country as a state question, sanctioning the deepest and most patient inquiry. (Signed) THIERRY.

Auckland, Feb. 17, 1857.

EXTRACT FROM LETTER OF MR. M. WHITLAW, DATED 11TH MARCH, 1857.

"In compliance with the request which you have done me the honour to make, I have forwarded herewith three samples of our manufacture. No. 1 is the best quality we have as yet prepared, No. 2 is that of our ordinary manufacture, and No. 3 is an article which we think may suit the purposes of the paper-makers well.

"The method of preparing the native flax for the

market which our firm has adopted is one which I invented several years ago; and I believe it differs from all others that have heretofore been attempted in this respect, that the fibre is separated from the leaf of the plant by a transverse action upon it, and not a longitudinal one, in imitation of the natives' method of manipulation, which so many have tried to do unsuccessfully by machinery. The whole process at our works is exceedingly simple. The flax is merely cut from the plant, passed through the machine, washed and dried. The washing is not an essential part of the process, but it serves to bring the fibre more speedily to a proper colour when exposed to the air.

"Our factory consists of a large iron building, of two floors. We have a steam engine of 15 horse-power and thirty-two machines, each of them capable, when in full operation, of producing fully 100 lbs. of prepared flax per day. Each machine requires the attendance of only one boy. Other boys are employed in cutting, washing, and bringing the flax out to dry. Hitherto we have only had a small number of the machines in use, but we are gradually extending our operations, and hope in a few months hence to produce a very satisfactory quantity per day. At present we obtain our supplies of the material from the natural produce of the neighbourhood, but we are preparing to cultivate the best sorts in the vicinity of our works.

"As such a business is doubtless one of Colonial importance, and promises, if entered upon energetically by capitalists, to supply what is obviously a desideratum, especially in this Northern Province, namely, a profitable export, I shall be most happy to give all the information on the subject I may be possessed of, to any person intending to engage in it, and to show our works to any members of the Government who may be honoured with a visit, or to any Commissioners who may be pointed to inquire into this important branch of Colonial resources."

The specimens mentioned have been received and may be inspected by members and their friends at the Society's house.

SEVENTH ORDINARY MEETING.

WEDNESDAY, JAN. 20, 1858.

The Seventh Ordinary Meeting of the Hundred and Fourth Session, was held on Wednesday, the 20th inst., Sir John Rennie, F.R.S., in the chair.

The following Candidates were balloted and duly elected members of the Society:—

Goodchild, John James | King, T.
M'Donald, James.

The following Institutions have been taken into the Union since the last announcement:—

451. Ebbw Vale Literary and Scientific Institution.
452. Neath Mechanics' Institution.

The Paper read was:—

ON THE MANUFACTURE OF PUDDLED WROUGHT STEEL, WITH AN ACCOUNT OF SOME OF THE USES TO WHICH IT HAS BEEN APPLIED.

By WILLIAM CLAY, OF THE MERSEY STEEL & IRON WORKS, LIVERPOOL.

In the paper which I am now about to submit to your notice, I have endeavoured to treat of this comparatively new process, viz., the manufacture of puddled wrought steel, with an account of some of the uses

which it has been applied, only in a mechanical and practical point of view, and to avoid entirely any questions as to the chemical change which takes place in the conversion of the crude cast iron into steel; and I have also endeavoured to avoid instituting any comparisons between this process and any others which seek the same result, viz., the manufacture of cheap steel.

It will be well known to many interested in the manufacture of metals, and more especially to any who may have lately had occasion to visit the continent of Europe, that the manufacture of puddled steel has now been practised there for many years, and that the make is rapidly increasing, but, as yet, the uses to which this material has been put are very limited when compared with the vast advantages which would be derived from adopting so strong and durable a material, when produced at a moderate cost.

The process I am about to describe, was patented in the year 1860, by Mr. Ewald Riepe, and it may be asked how it comes to pass that so valuable a patent has been allowed to remain almost entirely unknown in this country, when it was granted so long ago as 1860. One reason is the bad state of health of the patentee, who has seldom been able to devote more than a few days, at any one time, to the subject in this country, without becoming so ill as to be incapacitated from attending to business again for a considerable time. Another reason (as I am informed) is that the patentee, about the date of the patent, came over here and entered into working arrangements with one of the most important firms in this country, viz., the Lowmoor Iron Company, who have, up to this time, made about 1,000 tons of the puddled steel, but who have not, I believe, carried the manufacture of it beyond the puddling process, but have sold the puddled bars to various Sheffield houses for them to carry into the further stages of manufacture, and more especially to Messrs. Naylor, Vickers, and Co., of that town, who have used this material very largely for the manufacture of their cast steel bells, which, I may mention by the way, are also the subject of another patent by the same inventor.

In describing the process of making the puddled steel, I cannot do better than read an extract from the specification of the patentee:—

RIEPE'S PATENT.—"These improvements consist—Firstly, In a peculiar method of working in the puddling furnace. Secondly, In converting pig-iron, or alloys of pig-iron and wrought-iron, into steel, with the co-operation of clay in the furnace. Thirdly, In or by the co-operation of atmospheric air.

"Firstly, I employ the puddling furnace in the same way as for making wrought-iron. I introduce a charge of about 280 lbs. of pig-iron, and raise the temperature to redness. As soon as the metal begins to fuse and trickle down in a fluid state, the damper is to be partially closed in order to temper the heat. From 12 to 16 shovelfuls of iron cinder discharged from the rolls or squeezing machine are added, and the whole is to be uniformly melted down. The mass is then to be puddled with the addition of a little black oxide of manganese, common salt, and dry clay, previously ground together. After this mixture has acted for some minutes, the damper is to be fully opened, when about forty pounds of pig-iron are to be put into the furnace, near the fire bridge, upon elevated beds of cinder prepared for that purpose. When this pig-iron begins to trickle down, and the mass on the bottom of the furnace begins to boil and throw out from the surface the well-known blue jets of flame, the said pig-iron is raked into the boiling mass, and the whole is then well mixed together. The mass soon begins to swell up, and the small grains begin to form in it and break through the melted cinder on the surface. As soon as these grains appear, the damper is to be three-quarters shut, and the process closely inspected while the mass is being puddled to and fro beneath the covering layer of cinder. During the whole of this process the

heat should not be raised above cherry redness, or the welding heat of shear steel. The blue jets of flame gradually disappear, while the formation of grains continues, which grains very soon begin to fuse together, so that the mass becomes waxy, and has the above mentioned cherry redness. If these precautions are not observed, the mass would pass more or less into iron, and no uniform steel product could be obtained. As soon as the mass is finished so far, the fire is stirred to keep the necessary heat for the succeeding operation—the damper is to be entirely shut, and part of the mass is collected into a ball, the remainder always being kept covered with cinder slack. This ball is brought under the hammer, and then worked into bars. The same process is continued until the whole is worked into bars. When I use pig-iron made from sparry iron ore, or mixtures of it with other pig-iron, I add only about 20 lbs. of the former pig-iron at the later period of the process, instead of about 40 lbs. When I employ Welsh or pig-iron of that description, I throw 10 lbs. of best plastic clay, in a dry granulated state, before the beginning of the process, on the bottom of the furnace. I add at the later period of the process, about 40 lbs. of pig-iron as before described, but strew over it clay in the same proportion as just mentioned.

"I do not claim the commencement of the above described process for making steel in the puddling furnace. But what I claim is the regulating the heat in the finishing process, and excluding the atmospheric air from the mass in the manner as described, and also the use or addition of iron to the mass towards the later part of the process."

The remainder of the specification it will not be necessary to allude to.

The balls, instead of being rolled into bars, may be hammered into slabs or blooms, for such uses as forgings, rails, plates, or any hammered or rolled steel which requires to be perfectly solid; but for ordinary use, puddled bars are made, at the Mersey Iron Works, from two to 14 inches wide, which are afterwards cut up and piled for various purposes.

In using the puddled bar steel, it has been found very desirable to test each bar before using it, and to closely inspect the quality, and to select such as is best adapted to the purposes required, for instance, for steel rails, or railway points, or switches, which I roll at one operation direct to the regular taper-form desired, under a patent which I have "for rolling iron or other metals of taper form." I select the most crystalline steel for the upper and under surface of the rail or switch, and for the interior that which is of a more fibrous and tougher description. Between the centre and top and bottom of the rail, I place steel of an intermediate grade, which causes the whole pile or mass to weld up easily and work solid.

It is necessary in this, as in any operation in which steel is used, to take the greatest possible care in the heating and working of the material; but from the first commencement there has been found no difficulty in heating, rolling, or forging this steel into any form or shape, as it has been made into steel plates, bars, angle steel, rivet steel, rails, railway points, and forgings of all kinds with perfect ease and with success, and ever since the manufacture was commenced at the Mersey Steel and Iron Works, this steel has been used for almost everything that was required to be of a strong and durable nature or to repair any of those breakages which are of such constant occurrence in every iron work.

It is somewhat worthy of remark that, although this process is so novel, and, apparently, of so delicate a nature, yet, with the specification as my only guide, having never before heard of or seen the operation, it succeeded perfectly in the first trial which was made, and produced so excellent a steel that, after working about 100 tons, it has hardly been surpassed. I have used pig iron of all descriptions, North Welsh, South Welsh, Staffordshire, and Scotch, with the same result, viz., the production of

It would not surprise me if, with more experience of this new manufacture, it should be found that wrought steel bears the same relative position with regard to cast steel that wrought iron does to cast iron.

There has of late been a considerable controversy respecting an alleged deterioration of wrought iron, when being made into large forgings, from a supposed crystallization of the material employed. I have always endeavoured to maintain, and in my work already referred to I have attempted to show, that where this crystallization took place it was purely the result of carelessness or incompetence.

With wrought steel, the danger from this cause is very materially lessened, indeed, rendered almost impossible, for the heat at which it welds is much less than that required to weld iron, as also if the steel be heated too much (and long before any deterioration from crystallization could set in) the forging when brought to the hammer would be so tender that it would fall in pieces, and would in that manner be wasted for the purpose required; there is, therefore, little fear that crystallization, otherwise bad workmanship, can materially injure this tell-tale production.

Steel forgings have been made, at the Mersey Steel and Iron Works into piston rods, (some with the piston forged solid, 18 inches diam., for a Nasmyth hammer), large roll screws, shear pins of all sorts, rolls for rolling iron, hammers and anvils, and for a variety of other purposes. In making these forgings no difficulty was experienced; rather more time was required on account of the necessity of heating the steel slowly, and also because the hammer did not make the same impression on it that it does upon iron.

The effect of forging upon this steel is to consolidate it, and when broken in the usual manner, the appearance of the crystals is much finer than when it is rolled, as might be expected.

Of all the various uses to which this steel may be applied, there are perhaps none so important as its application to marine and railway purposes; for the former use, the material offers directly so considerable a saving in regard to weight, with an equal amount of strength, (putting out of the question its durability and other advantages) that its universal adoption can hardly be doubted. A commencement has been made by the Board of Admiralty, who have used considerable quantities of Howell's homogeneous metal in the manufacture of marine steam boilers, as stated in the *Times* newspaper of July 6th, which says, "In consequence of the successful trials which have been made at Woolwich, of Messrs. Short, Stirling, Howell, and Jessop's homogeneous metal, government have given directions for the use of that metal in the construction of steam boilers, one of which is ordered to be made for the 17 gun steam-sloop *Malacca*, Captain Arthur Farquhar."

For railway purposes it is nothing new to propose steel for rails, points, and crossings, &c., as the attention of engineers has long been directed to it, both in this country and abroad, but the difficulty has hitherto been the cost of steel for such purposes. Some attempts have been made to harden the face of rails, and to steel the working parts of tyres, but, I believe, the result has not been altogether satisfactory, and the cost considerable; but with wrought-steel the tyres, points, or rails, may be made altogether of hard crystalline steel, or an outer surface of hard and an inner portion of fibrous steel, as required, and at a cost very materially less than that at which steel has hitherto been produced.

With regard to the ultimate resistance to tension of steel as compared with iron, we find by the tables recently published in the reports of experiments on the strength and other properties of metal for cannon made by officers of the United States Ordnance Department, that the strength of various descriptions of English, American, and Russian wrought-iron, tested by them, varied from 53,903 lbs. to 62,644 lbs. per square inch.

The ultimate cohesion of tilted cast steel bars, as published in Table No. 9 of Mallet's work on the construction of artillery, is stated at 142,222 as the highest, with 88,657 as the mean per square inch.

Other estimates of the ultimate cohesion of steel give,

Tempered cast steel at	150,000 lbs.
Cast steel	184,256 "
Shear steel	124,400 "
Blister steel	133,162 "

With wrought-steel I have also found considerable variation in regard to tensile strength, more particularly when experimenting, as it is necessary constantly to do in a new manufacture, with various descriptions of pig-iron and different charges. But when working regularly I have found no more difficulty in obtaining an uniform result than in the manufacture of iron, and with more experience we may safely expect some improvement even in this particular.

The first bar that was tested broke at 173,817 lbs. per square inch. This extraordinary endurance I have not since equalled, the nearest approach to it being 160,832 lbs. per square inch.

The average tensile strength of the steel, however, may be estimated at about 50 tons per square inch, or 112,000 lbs.

Of four samples tested at the Liverpool Corporation chain-proving machine, on the 8th January, 1858, the first bar, which was made as hard as fire and water could render it, broke at something less than 112,000 lbs., but the exact weight was not ascertained. (This trial bar was from the same steel as No. 3, which, as will be seen, bore the heaviest test in its natural state.) Test bar No. 2 broke at 112,000 lbs., or 50 tons per square inch. No. 3 broke at 125,440, or 56 tons per square inch. No. 4 broke at 98,560 lbs., or 44 tons per square inch.

Mem.—This last sample had a slight flaw, which probably caused the difference.

TABLE C.—Tensile strength of Iron and Steel Bars per square inch.

Descriptions of Iron and Steel.	Tensile strength.	Authority.
Russian Iron	62,644	{ American Board of Ordnance.
English Rolled Iron	56,532	
Lowmoor "	56,103	
American hammered	53,913	
Krupp's Cast Steel, } average of 8 samples	111,707	{ Minister of War, Berlin. Mallet. Ditto.
Cast Steel, highest	142,222	
" mean	88,657	
" tempered	134,256	
"	150,000	
Shear Steel	124,400	
Blister "	133,162	
Mersey Steel and Iron Co. Puddled Steel, highest	173,817	
Ditto, another sample ...	160,832	
Average of three sam- ples tested at the Liverpool Corpora- tion testing machine	112,000	

This steel will also be found most useful for chains and ships' cables, and although the few samples which I have had made all broke at the weld, evidently from want of experience on the part of the smith in working this new material, yet the strains borne at the Liverpool Corporation chain testing machine, even with imperfect welds, are tolerably satisfactory, as will be seen by the following:—

	Tons.	Gwt. proof strain.
Chain $\frac{1}{2}$ in., close link, broke at ...	12	3 15
Chain $\frac{1}{2}$ in., stud link, broke at ...	13	5 10

steel; but I have not found, so far, anything at difference that I expected between hot and cold. Most excellent results have been obtained in this more particularly important as it is the extent to which this manufacture may be made, not be circumscribed by the very limited old-blast pig iron.

I have described the process of manufacture, it is necessary to show a few of the qualities of the produced.

Produced-steel bar when broken shows a clear crystalline fracture, and has the usual sonorous murmur when struck. The crystals appear much finer than in ordinary blister steel, in fact, regular eye, the appearance is quite like that of cast steel, and it has all these distinguishing characteristics which steel is known from iron. It hardens in that may be requisite, taking all the colors, and themselves under the different degrees of temper. It may be made into such articles as ordinary tools, and the puddled bar; it will take a polish from the puddled bar; it will take a polish and has the same amount of elasticity as steel.

I believe it to be useful in the Arts for which steel is required, except, perhaps, for the manufacture of tools and cutlery.

It is an extraordinary feature in regard to this steel that it can be produced either of a hard or a soft character, or of a soft silky fibrous character. The grades between these two points of the cold may be bent up down with quite extreme difficulty certain (with stiffness of the material) with a hammer, but, when forced back to the original position, the fibre is apparent; or if a piece of the fibre is cut through with a chisel, it is cut beautifully fibrous; if made into a wire and hardened, it at once assumes a peculiar character.

A series of experiments with rollers and laminating of bars, and a paper on "The Formation of Masses," for a work entitled "On their Alloys," and details of their "that taking." I found that puddled iron, and re-heated, piled a portion five hundred into bars marked under into the centres of the piles as before, and so on. The iron had undergone two operations.

The following Table A shows the number bore:—

No.	
1.	Puddled bar
2.	Re-heated ...
3.	" "
4.	" "
5.	" "
6.	" "
7.	" "
8.	" "
9.	" "
10.	" "
11.	" "
12.	" "

"It will thus be seen that the increase up to No. 6 perhaps be attributed to the (effective), and that in a somewhat similar ratio to the

In a somewhat similar ratio to the taken with this, and the piling, when the

respect
gradu
found
No.

...nered and rolled
...weights.

...were of too
...would have been
...the best results
...hard and soft steel,
...central axis, the part
...and the soft, which

...length of this steel, I
...steel and iron plates
...plates were all $\frac{1}{4}$ -inch
...-inch (circular).

Tons. cwt.

...ed with a	8	18
...	8	3
...	15	10

...strength of steel plates,
...required to break a square
...11 to 55 tons.

...mention also, that there is
...steel, either hot or cold, in
...descriptions of iron are
...knowledge or skill is re-
...men who use it.

...importance of steel as a mate-
...building purposes, as also for
...economy in the weight of
...greatest importance for these
...purposes.

...indulge for the very imperfect
...amour of laying before you,
...the very limited time that
...the manufacture of this
...from the extraordinary and novel
...have been often much perplexed and
...renew experiments again and again
...comprehend the sometimes apparently
...presented themselves, and added
...the first place necessary to unlearn
...and always been accustomed to look
...of all knowledge of the iron and
...task much more difficult than the
...idea, when the mind is not occu-
...sed notions and old established

...which I have tried, I have taken
...accurate as possible, and as the trials
...had more and more cause to feel
...obtained, and, had time permitted,
...glad to have extended the trials, as
...gated the nature of this material the
...I found it.

...moment anticipate that steel manu-
...patent process will supplant the best
...steel, but I feel confident that it must
...use for most ordinary purposes, where
...its great cost, cannot be used.

...might indulge somewhat in prophecy, I
...my belief that, in a few years, the manu-
...wrought steel will have become as im-
...ch of our national industry as that of iron

...facts which I have, however imperfectly,
...this Society, lead to further inquiry by
...competent, and having more leisure to con-
...a successful issue, I shall be amply repaid
...and pains that I have bestowed upon the

which you forwarded to me. It is not only of great interest, but highly instructive to all in the present state of the manufacture of steel. When the production of a steel by puddling becomes more developed and improved, it will be applied to many useful manufacturing purposes, as well as to civil engineering.

Mr. Clay describes Mr. Riepe's process, which originated in Westphalia. The idea of manufacturing steel in a puddling furnace emanated from a process long practised in Germany for making natural steel, called "German steel;" and on a close examination, the effect produced upon the pig-iron used will be found to arise from similar causes. In the manufacture of steel by the puddling process, the object is to decarbonise the crude iron acted upon, and this is attained by allowing it to remain for some time in a fluid state, acted upon by the air which passes through the furnace, and assisted by the addition of a silicated oxide of iron, which is largely added to the metal when in fusion. The mass then becomes to some extent decarbonised, but the iron cinder which has been added has induced the production of a silicate of iron, which, however, is decomposed by the addition of a flux, similar to that used by Dr. Schafheutel in his patent process for producing steel-iron; the oxide of manganese which is used then forms a silicate of that metal, whilst the alkaline property of the other ingredients assist in liberating the iron, which has now nearly arrived at a malleable state. The remainder of the process is a carbonising one, and requires much care and experience from the workman. The raw steel so obtained is subject to many imperfections, from the nature of the means taken to produce it, and as such, whilst it is very useful for many purposes where strength is required combined with lightness, yet it has been found unfit for any hardware purposes, excepting the commonest articles. In Germany, the raw steel is doubled and welded many times before it is used for manufacturing purposes, and even then its molecular construction renders it unfit for making a file or cutting tool, whilst, on the other hand, it is well suited for railway tyres, switches, &c.

Metallurgical processes are progressive. Mr. Clay has detailed to us the mode of producing the material, and he has, with his practical ability, carefully examined the changes which the iron undergoes in the furnace. He is aware of the nicety of the operation, and, consequently, the necessity of careful as well as skilled labour to produce a uniform quality. Doubtless he has noticed many imperfections in the process, and a close examination of the steel so produced has shown him that the atomic construction of the metal is far from perfect. I would, therefore, earnestly draw his practical attention to the fact, that the means adopted for carrying out the theory upon which the process is based, may be rendered more perfect. I would ask, is it necessary to add so large a mass of deleterious matter to the fluid metal to obtain a simple decarbonisation? Mr. Blackwell, in his paper on iron, read before the Society in May, 1855, states, "that it appeared desirable to introduce between the blast furnace and the puddling furnace some intermediate process, which, like that of the *mazéage* of France and the continent generally, should sufficiently decarbonise the grey pig iron at small cost in labour and fuel." This desirable object I have attained by subjecting crude iron, from the blast furnace or a cupola, to the action of any chemical re-agent capable of disengaging oxygen during its decomposition,—thus carbonic acid, or carbonic oxide gases, will be produced by the decomposition of the substance, and by the union of the oxygen contained therein with the carbon contained in the fluid iron from which it is eliminated; the gases so produced, being unable to re-enter the metal, either pass off in vapour, or act upon the silicates or other earthy compounds which the crude iron may contain, precipitating the metallic part, and allowing the earthy matter to flow away as slag, containing compar-

Following letter has been received by the

Sheffield, Jan. 19th, 1858.

I have read Mr. Clay's paper, a proof copy of

fected, it would lead to the consumption of a vast quantity of this new kind of steel.

Mr. CHARLES MAY regarded this invention as the commencement in this country of the most important movement in the metallurgy of iron that had taken place for many years past. He had had his eyes upon the various improvements introduced into the manufacture of iron, particularly the method introduced by Uchatius. In most of these there seemed to him to be many important practical objections. As to granulating pig iron and selling it in crucibles, it was a "peddling" process, producing a commodity by pounds which was required by tons. One of the most important services that could be rendered to society would be the production of a steel suitable, not so much for the finer description of tools, as for rails and similar purposes, at a cost not much higher than that of the material now employed. If that were done, they might have a really permanent way upon railways, which, at present, did not exist. This process, if brought into general use, would be improved upon as the manufacture proceeded. They must not be discouraged because it was not yet perfect. The great thing was to encourage manufacturers to carry it on. They were aware of the great difficulty of introducing improvements of any kind in iron works. The ironmasters were, for the most part, men of great wealth, and did not care about improvements. If by this process they could get steel rails at 50 per cent. above the cost of the ordinary iron rails, it would be a very great boon. This material might enter into every part of the structure, not only of the permanent way of railways, but also of the entire rolling stock. It would enable them to lighten the rolling stock; and whilst in one direction they increased the resisting power of the permanent way, on the other hand they decreased the force of the destructive effects upon it; he therefore looked hopefully upon this process. It however struck him as an extraordinary thing that fifteen or sixteen shovelfuls of cinder slag should be used to 300lbs. of iron. He had no doubt that experience would lead to a considerable reduction in that quantity. He understood that, in this process, decarbonizing was the principal thing, although the theory had been set up that carbon was not the only important element in the conversion of iron into steel. Mr. May then entered into a brief description of Siemens's furnace for the admission of heated air, the result of the use of which was, as he had been informed, that in a steel furnace upon that principle a ton of metal was melted with a consumption of only 10 cwt. of coke, as against 90 cwt. with the ordinary furnaces, and Mr. Siemens was at present engaged in applying the same principle to puddling furnaces.

Mr. NEWTON believed at present very little had been done with reference to the manufacture of steel rails, to which Mr. May very justly attributed so much importance, but steel points had been somewhat extensively introduced. Hitherto some difficulties had been experienced with regard to steel rails, inasmuch as although the hardened surface was better calculated to resist wear and tear than the ordinary iron rails, yet the brittle character of the steel was found to be an objection. Mr. Sanderson had lately taken out a patent for hardening and tempering rails, whereby the strength was much increased, and he thought this process would tend to effect that which Mr. May considered so desirable, namely, the providing a really permanent way. He, however, was not able to state what would be the advance of price of Sanderson's process of hardening over that of the ordinary rails.

Mr. WILLIAM HAWES would say a word in defence of a very large body of, he believed, intelligent and able men engaged in one of the most important manufactures of this country. Mr. May had told them that the ironmasters were slow to adopt improvements, and for that reason he was afraid to entrust any new process of manufacture to them; at the same time Mr. May looked hope-

fully to patents taken out by persons not belonging to that class. It was dangerous in a Society of this kind to indulge in wholesale condemnation of any class of manufacturers. He believed the iron-masters of this country would be found always ready to adopt any new plan of real practical utility, for their own benefit in the first instance, and afterwards for the benefit of the community.

Mr. KIRROE said, although not practically acquainted with the manufacture of iron, yet he had tried steel of a similar character to this in the construction of the larger description of taps, and he had found that, in many cases, the metal would not harden without splitting. At the same time, he had made tools for turning purposes from this kind of steel with satisfactory results.

Mr. WM. SMITH remarked that, in the tables A and B, he saw nothing to indicate whether the strains applied were per square inch of metal. He should be glad to be informed as to the description of testing machine employed in these experiments. Another material question was, how this metal behaved under the test?

Mr. CLAY said, before replying to the questions that had been asked, he begged to say that he was only interested in this process as any other iron manufacturer might be. The firm with which he was connected merely worked the patent under a license, but, considering it a subject of vast importance to the engineering interests of the country, he had felt it his duty to bring the subject before the public at the earliest possible date, although, perhaps, a little more time would have enabled him to have put the matter forward in a more complete form. In reply to Mr. Sanderson, the manganese, although mentioned in Mr. Riepe's patent, was not an essential element in the manufacture of the steel, nor was the use of it claimed by him. With respect to the large quantity of cinder slag used, it appeared to be absolutely essential to the success of the process, being used to protect the molten crude iron from the action of the atmosphere. The difficulty in welding, that had also been noticed, was not experienced in working this material. He (Mr. Clay) could confirm what had been said as to the suitability of this steel for miners' tools, it having been used in some of the mines of North Wales with great success. With reference to the cost of manufacture, he felt no doubt that this would be materially reduced as experience was gained, but even at the present early stage, he thought that Mr. May's desire to have steel rails costing only 50 per cent. more than iron ones might not be far from being realized, and that ultimately the cost would probably not exceed that of iron by more than 10 or 20 per cent. With regard to ordnance, on which some further information was desired, he wished it to be clearly understood that he anticipated no difficulty in the manufacture of guns, as described in the paper. The facility in welding this material gave the manufacturer the opportunity of placing the different descriptions of steel, whether hard or soft, in the particular positions required. A hard crystalline steel might be used as the first layer, from which the bore would be taken out. The exterior would be of a softer metal, more elastic than the interior portion, and better able to withstand the immense concussion of the discharge. With reference to the difference alluded to in the results shown by the experiments made at the Corporation testing machine, and those in his (Mr. Clay's) own works, this was caused by the difference between the samples of steel employed. It would be observed that the variations were not nearly so great as in the experiments detailed in Mr. Mallet's work. The bars tested were half-inch square, and the results were, of course, calculated from them. The testing machine was a powerful steel yard, which was attached to one end of the bar, the other end being firmly fixed to a strong bed-plate, and the weight gradually increased until fracture ensued. With regard to the rolling of steel plates, many tons had been successfully produced and tested, the average tensile strength being about the same as that of the bar.

tively but by adding a chlorine will evolve carbon dioxide gas, and other causes such as iron, I obtainable of being iron.

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RESIN OIL FOR BURNING IN LAMPS.

In the manufactories now established for preparing resin oil in various countries, many trials have already been made for preparing it in a state fit for burning in lamps, it being thought that if the resinous parts which prevent its burning in ordinary lamps could be removed, and these lamps could be constructed so as to allow the resin oil to be burnt in them, they would furnish in this way a light of great intensity at a very small expense.

It is stated that the proprietors of a manufactory of resin oil, near Wiesbaden, have at last succeeded, after continued trials, in purifying it, and in constructing ordinary lamps with a never-failing reservoir for the oil. The Argand burner, with a double draft of air, by merely a small alteration, has been rendered available, producing a beautiful white light, which, with a diameter of 1·2 centimetres, is equal to the light of four tallow candles, at $\frac{1}{10}$ th of the expense. The light is said to be so intensely bright that it is even painful to the eye.

A resin oil lamp, giving the light of four tallow candles, consumes in one hour $\frac{3}{4}$ th of an ounce of oil; a pound of this costing about 4d., so that the consumption in one hour is about one-tenth of a penny.

A further advantage of the above-mentioned lamp is said to be its extreme simplicity in construction.

SOUTH KENSINGTON MUSEUM.

During the week ending 16th January, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,289; on Monday, and Tuesday (free evenings), 3,139. On the three students' days (admission to the public 6d.), 771. One students' evening, Wednesday, 483. Total, 7,682.

Home Correspondence.

LOWERING VESSELS, &c., DOWN INCLINES.

Sir,—The following plan, which I propose for enabling ships, &c., to be moved down low inclines, or raised steep ones, has been specially adapted to the case of the *Leviathan*, but the object has been kept in view of ordering hints which may be useful on future occasions, as there appears to be a disposition to adhere to the original plan, as regards the *Leviathan*, and increase the force until it is sufficient to propel the vessel on the ways with a sliding action, notwithstanding the expense and delay which the enormous friction of the method necessitates.

The plan I propose consists in partly substituting a sliding motion for a sliding action, by introducing a large number of cannon balls beneath the cradles, and it would be applied to the *Leviathan* as follows:—

Between every second or third rail of the present ways there would be laid a trough-shaped rail, passing from the upper side of the cradle under the ship to the bottom of the "ways;" the width of the trough would be little more than the size of the shot, which, in the present instance, would be small, say six pounders, and the depth about half the diameter. Plates would be placed above these for the upper side of the balls to roll over, which would extend the width of the cradles. These plates would be 12 inches wide, with a flange along each side of about 1 inch deep, and the inner face would be slightly concave from the sides to the centre, in order to allow for the lower troughs not being accurately parallel with each other all along the ways, and yet give the cradles a tendency to keep the upper plates in the centre of the lower troughs. This would provide for five or six times the error which need exist in the troughs, as they would

be laid as nearly parallel with each other as practicable, and it would also allow for the tendency which one end of the vessel has to precede the other, even though it should do so to the extent of 18 feet, as there would still be plenty of room between the balls and the side flanges.

The lower troughs being laid on the cross beams which support the present rails, the upper plates would be introduced above them, leaving a space of about a quarter of an inch between their upper surfaces and the lower surfaces of the present iron cross bars. A ball would then be introduced into the trough, and retained in its place, immediately under the outside cross bar, by a rod passed up the trough from the lower side of the cradle, until a steel wedge had been inserted between the cross bar and the plate, and driven in a little. The next ball would then be passed up the trough and retained under the second cross bar in the same manner, and so on until a ball had been placed under each, when the wedges would all be driven tight.

The balls in the next line of trough would not be placed under the cross bars, but half-way between them; those in the next trough would be placed like the first, and so on alternately throughout the series, in order that when the vessel was in motion, one set of balls should be under the firmest part of the structure, whilst the other set were passing over the less supported part of the troughs, which would then be subjected to deflection.

After all the balls had been introduced, which would amount to 4,500 if placed between every second line of the present rails, the wedges would be driven home until a sufficient portion of the weight was removed from the rubbing surfaces on the rails to the rolling surfaces on the balls, to enable a comparatively small force to drag the vessel down the ways; and in order to ascertain by actual trial when this was accomplished, and the forces properly balanced, the strain would be kept on the vessel whilst the wedges were driven home, and the driving continued until the force applied was sufficient to cause it to move, and then the vessel would be immediately stopped again by clamped blocks, placed 2 or 3 inches below the front of the cradles, which would extend across all the rails, to prevent the possibility of the vessel moving farther than it was intended to do. The men would stand upon the cradles to drive the wedges, so as to be out of danger when the vessel moved over the allotted distance of 2 or 3 inches, after which "jack shores" would be placed against each end of the vessel, to afford security whilst the clamp blocks were removed from the rails, as the shores could be removed without any men being in the course of the vessel when the time had arrived for starting it.

As a matter of precaution, the upper plates would be bolted to the cradles, although they would have little tendency to move by the balls rolling under them, whilst their upper surfaces were restrained by contact with others which must rub and not roll.

In order to keep up the supply of balls, and bring them into action as others rolled out, a self-acting arrangement would be placed on the lower side of the cradles, at the commencement of each upper plate, which would place a ball in the trough, and give it a blow at the same time sufficient to cause it to hold in the entrance, and then the upper plate being a little tapered towards the end, it would cause the ball to be brought under the full pressure as the incline rolled over it. The arrangement would be made to supply the balls at any intervals that might be desired, and communications would be carried up to the deck by which the intervals might be altered, and the resistance of the vessel regulated to some extent whilst it was in motion.

If additional power over the motion were thought worth the expense, the arrangement might include bars for locking any number of the balls in the troughs, and converting the rolling to a sliding action.

At present, a notion seems to prevail that a sliding action is safer for lowering vessels than a rolling motion.

but upon what grounds it is not easy to imagine. It seems to me the safest notion must be that in which all the forces remain as constant and little subject to change as possible, and that this is most easily attained with a rolling motion, because the friction forms so small an item that its irregularity does not prevent the results being calculated and provided for with tolerable certainty, whereas, with a sliding action, the friction forms so large an item, which is subject to change by a difference of smoothness in the surfaces and in the quantity of lubricating matter between them, that it may suddenly require a much larger force to overcome it as one instant than as another, and give rise to starts and stoppages similar to those which have been exhibited in the motion of the *Leristhen*.

All that can therefore be converted from a sliding action to a rolling motion is so much taken from an uncertain method, and added to the side on which the focus can be accurately calculated and balanced.

Another notion seems to prevail that there is less friction between wood sliding on wood than with iron over iron; but some experiments which I have made leave little doubt about there being more friction with wood than with iron under a pressure of 250 lbs. to the square inch, which is the pressure of the *Leristhen* on its rubbing surfaces, and that the fact of vessels being launched from low inclines on wooden ways must therefore be attributed to something else. In these launches the surfaces are very extensive, and coated with a thick layer of lubricating matter, so that the vessel is really afloat before it reaches the water, not on a thin fluid it is true, but on a fluid which is sufficiently thick to resist being quickly pressed out from between the surfaces, so as to allow them to come into actual contact, and before this occurs the stern has been lifted up by the water, and the vessel acquired sufficient momentum to enable it to clear the ways. In these launches care is taken to arrange the surfaces, so that the lubricating matter cannot easily escape from between them, but in the *Leristhen* the surfaces have been arranged so that the upper ones act as scrapers to the lower ones, and clear away the lubricating matter as effectually as though they were special contrivances for the purpose.

I am, &c.,
E. T. LOSEBY.

Proceedings of Institutions.

BIRMINGHAM.—On Monday, January 11th, the annual meeting of the subscribers to the Birmingham and Midland Institute met in the Lecture Theatre, Paradise-street. Mr. Arthur Ryland (in the absence of Lord Hatherton, the president) occupied the chair; and there were also present Alderman Manton, Councillors Heaton and Smith, Messrs. Abel Peyton, W. Matthews, junr., Brooke Smith, Blakemore, John Jaffray, H. Wiggin, G. Jabet, E. Osler, Saunders, T. Martineau, R. Wright, S. Barker, G. J. Johnson, R. Peyton, jun., Horton, W. Shakspear, J. S. Dawes, T. W. Williams, Albites, W. M. Williams, T. P. Salt, Gold, W. B. Lloyd, P. Hollins, T. Kenrick, Hopkins, J. S. Wright, the Rev. C. Clarke, and others. The Chairman, after reading a letter from the President, explaining the cause of his unavoidable absence, said he must congratulate them on meeting in that theatre, built from the designs of Mr. Barry, and from the experience of every lecturer who had been heard in it, full of the expectations of the most sanguine and working part of the Institution was in a flourishing condition. It had taken a position which he never expected in so short a time. Looking back at the period since it was projected, costing £10,000 for building, they

were greeted with an incredulous smile; when he talked of uniting all classes in an Institute, they gave the same smile once more. Yet they had done both the things, and had done them well. Still much remained to be done, and he was confident that what was still to be done would be done with success, because he knew men who had brought the Institute to what it was, and work it out to a satisfactory conclusion.—Mr. Mathew, the honorary secretary, then read the report. He gratulated the members upon the increasing efficiency of the general and industrial departments, upon the completion of the new lecture theatre, and upon the progress of the remainder of the first portion of the new building. Since the last annual report, 146 new members had joined the Institute, making the total 484. Lectures for the past year were then alluded to, and for the current year were indicated. The Patent Specification Library appeared to have been of considerable utility, 249 persons having consulted it during the year. The council also acknowledged a donation of 500 vols. from the Museum of Practical Geology. Mr. Brougham and Mr. Charles Dickens had been elected honorary members. The proceedings in the Industrial Department had been of considerable importance. A proposition had been made to affiliate the Institute with the University of London, so that students of the Institute passing the requisite examinations might be able to graduate in that University; but, from a variety of reasons, it seemed premature to make the application. A notice had lately been promulgated by the University of Oxford, and an examination would probably be held in Birmingham at Midsummer next; but as none but youths of eighteen years of age would be permitted to compete, it was feared that not many of the students of the Institute would be able to take advantage of it. The report proceeded to allude to the Institute's own examinations, and to the prizes given by Lord Hatherton, Mr. J. Cornforth, and other members of the council, and alluded to the fact that Lord Brougham had presented copies of his works to be given as prizes in the industrial department. The teachers' board had been requested to report upon the question of certificates and prizes, with the view of fixing some standard for the examinations; and matter would require careful consideration in connection with the schemes of the Society of Arts and the University of Oxford. The Latin class had been absent in consequence of the small number of pupils and difficulty of securing a regular teacher. On the other hand, a class had been formed for practical chemistry, which supplied a want long felt by chemical students. Although the department was not yet quite self-sustaining, its state was on the whole very encouraging, as appeared from the reports of the teachers. Exclusive of attendances at the penny lectures and the penny arithmetic class, the number of students on the books at the end of the autumn term was 396. More teachers were wanted, and the members could render the Institute no more important service than by giving their assistance in the conduct of the classes. Having alluded to the lectures delivered, the report went on to say that Williams's classes having suffered from a want of scientific apparatus, the Council purchased from Mr. Allen for £85 a set of apparatus for the illustration of light and heat. The Board of Trade Department of Science and Art promised to contribute two-fifths of the cost, and the rest was raised by private subscription. The accounts for the past year, which had been made up on the 30th November last, had been duly audited. The financial condition of the general department was very satisfactory. Comparing 1856 with 1857, the receipts from subscriptions had risen from £282 to £433 15s. and the lecture admissions from £50 8s. to £26 4s. 6d. On the whole the income had exceeded the expenditure by £114 12s. 2d.; but this had to be reduced by £5 3s. 4d. being the excess of expenditure over income in the industrial department. This department has been so near

supporting that the Council could not but congratulate the members upon the result. The class fees had ascended from £183 14s. 4d. in 1856, to £194 1s. 1d. in 1857. The amount received from the penny lectures somewhat fallen off. The Council regretted that omission of the building fund was not equally favourable.

The total amount of new donations received in 1857 was £41 3s. 6d., including £100 from Prince Albert, a second donation from the president, Lord Alton, and £61 6s. 4d., which was kindly presented to the gentlemen connected with the proprietary, being the proceeds of a ball held for the benefit of the Institute. A considerable sum had also been obtained by the zealous labours of several gentlemen in raising some of the wards of Birmingham. The amount already expended upon the building, in the cost of Act of Parliament, in the purchase of the outlying interests in the property conveyed by the Town Council, and in preliminary and other expenses, was £21 1s. 7d. To meet the amount which would be due upon engagements already entered into, to provide furniture and fittings, it would be necessary to raise a further sum of at least £5,000. A meeting was afterwards addressed by Mr. Brooke, Mr. J. S. Wright, Mr. Langford, Mr. W. M. Mason, and Mr. Kenrick. Alderman Manton moved a vote of thanks to the President and Council, which was seconded by Mr. Heaton, and passed amidst applause. A motion of Mr. T. Martineau, seconded by Mr. Lloyd, thanks were voted to the teachers.—The President said it might be interesting to state that the attendance at the classes was 2,250, and at the lectures 7,318. He thought that the want of system in the classes was the rock on which the Institution generally split.—Mr. Smith then moved a resolution that Mr. Ward be requested to accept the office of President for the year, which was seconded by Mr. T. Willmott, and agreed to.—Mr. P. Hollins suggested that the scruples of Mr. Ryland to continue in office were great, he hoped the meeting would overcome them, and therefore moved that Mr. Ryland and J. B. Mason be appointed vice-presidents.—Mr. H. Wiggin seconded the resolution, remarking that if it had not been for the exertions of Mr. Ryland, the building would have been in existence. The motion having been carried, the election of other officers took place, and the meeting separated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Jan. 15, 1858.]

Dated 18th September, 1857.

2428. George Edward Dering, Lockleys, Hertford.—Improvements in laying down electric telegraph cables, in obtaining soundings, and in ascertaining the position of and raising submerged electric telegraph cables and other bodies.

Dated 30th November, 1857.

2980. Jean Baptiste Couy, Nantes.—Improvements in the manufacture of manure, and for the disinfection of animal and vegetable matters.

Dated 9th December, 1857.

3045. Charles Westendarp, jun., Mincing lane.—Preparing a material as a substitute for Ivory, which he proposes calling "artificial Ivory."

Dated 17th December, 1857.

3095. Montague John Turner and Marcus William Turner, Woodcote, Surrey.—The improvement of conduit pipes and tubes for sewers, drains, conduits, gas, and other purposes.

3096. Francis Mollett Blyth, Norwich.—Improved apparatus for cutting and pulping turnips and other roots.

3097. William Bilzard, 14, Victoria-terrace, Notting-hill.—Improvements in the treatment of India rubber by a new process for the manufacture of a crystalline and colourless varnish for waterproofing all kinds of textile fabrics and papers, without smell and without in any degree altering their appearance, and for making divers varnishes and paints.

3099. Mark Mason, Dukinfield, Chester, and Thomas Markland, Newton, near Hyde.—Improvements in machinery or apparatus for printing.

3101. Edward Highton, Regent's-park.—Improvements in electric telegraphs.

3106. John Henry Johnson, 47, Lincoln's-inn fields.—Improvements in lubricating the journals of shafts and spindles. (A communication.)

Dated 18th December, 1857.

3107. Joseph Bennett Howell and John Shortridge, Sheffield.—An improved mode of rolling steel for springs.

3109. David Bowles, Reddish, Lancashire.—Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

3113. James Murdoch Napier, York-road, Lambeth.—Improvements in letter-press printing machines.

Dated 19th December, 1857.

3115. Thomas Newey, John Corbett, and William Henry Parkes, Birmingham.—A new or improved method of treating or coating steel pens and pen holders, to prevent the oxidation of the same, which method of treating or coating may also be applied to other articles of iron and steel.

3119. William Walker, Leeds.—An improved apparatus for the purposes of heating and drying.

3121. Richard Archibald Brooman, 166, Fleet-street.—Improvements in lime kilns, and in apparatus employed for working the same. (A communication.)

3123. Thomas Coles, Bristol.—An improvement in chaff cutters.

3124. William Bough, 1, Jewin-crescent, Cripplegate.—Improvements in lamps and wicks for burning resin and other oils and fluids, parts of which improvements are applicable to Argand gas burners.

3126. Robert Musket, Coleford, Gloucester.—Improvements in the manufacture of iron.

Dated 21st December, 1857.

3129. William John Kendall, Norwich.—An improved safety signal for railways.

3121. Francis Taylor, Romsey.—Improvements in closets or privies.

3132. George Tomlinson Bousfield, Loughboro'-park, Brixton.—Improvements in machinery used in the manufacture of springs, and in the application of springs to carriages. (A communication.)

3133. William Henry Myers, 202, Whitechapel-road.—An improved coffee pot, made of metal or earthenware, to contain coffee and milk or cream separately, the same being used as a chocolate pot, the same invention being applicable to teapots for the same purposes, made either in metal or earthenware, the same invention being applicable to table urns, and the same invention being applicable to jugs, made either in earthenware, or glass, or metal, to contain spirits and water or other liquids in different compartments.

3136. Richard Archibald Brooman, 166, Fleet-street.—Improvements in breech-loading fire-arms. (A communication.)

3137. Alphonse Renf le Mire de Normandie, Judd-street, Brunswick-square.—Improvements in apparatus used for distilling sea water on board ships and vessels.

Dated 22nd December, 1857.

3139. Arthur Challis Kennard, Falkirk Iron Works, Stirling, N.B.—Improvements in trussed iron bridges. (A communication.)

3141. John Henry Johnson, 47, Lincoln's-inn-fields.—An improved signal apparatus to be attached to common road carriages. (A communication.)

2143. Orlando Greenhaigh, and Robert Hutchinson, Horwich, Lancashire.—Improvements in apparatus for stirring and mixing colours for calico printing and other purposes.

READINGS FOR THE ENSUING WEEK.

- Monday, 7.
 Geological, 8. Anniversary.
 Geological, 8. I. Reports on the Expedition up the River by Dr. Baikie, R.N., and Mr. May, R.N. II. Further particulars of the progress of the British North American Exploring Expedition, as far west as long. 109° 30' to the Lower Saskatchewan, by Captain Palliser. III. Journey from Little Namaqualand eastward along the Orange River, the Northern Frontier of the Colony, &c., with Map, by Mr. Robert Moffat.
 Royal Inst., 2. Prof. Huxley, "On Vegetable Life."
 Geological, 7.
 Civil Engineers, 8. Mr. T. B. Sawyer, "On Self-Acting Tools for the Manufacture of Engines and Boilers."
 Civil and Chirurgical, 8.
 Geological, 9.
 Society of Arts, 8. Mr. J. G. Craze, "On the Use of the Museum Collection of Italian Art in modern Art Manufacture."
 Geological Asso., 8.
 Royal Inst., 2. Prof. Tyndall, "On Heat."
 Royal Society Club, 6.
 Pharmaceutical, 7.
 Pharmaceutical, 8.
 Royal Inst., 8.
 Royal Inst., 8. Mr. W. R. Grove, "On Molecular Impressions by Light and Electricity."
 Royal Inst., 3. Mr. C. E. Bloxam, "Chemistry of the Electrolysis of Water."
 Natural, 8.

3145. George Bridge, Bolton, near Macasfield, and Job Hamer, Longright, near Manchester—A new process or manufacture for converting woven silken fabrics or silk waste into a fibrous material fit for being spun into yarn or thread, or for being mixed with silk, woolen, cotton, or any other material to be spun into yarn or thread, and of improvements in machinery to be employed in such process or manufacture.

Dated 23rd November, 1887.

3146. Daniel Jones Crossley, Hebden Bridge, York-shire—Improvements in the manufacture of certain textile fabrics, called Pelloes, and used for saddle covers, and in the machinery or apparatus employed therein, which improvements are also applicable for weaving other fabrics.

3147. Thomas Landi, 14, Rue de Boulevard, Batignolles, Paris, and Charles Falconieri, 20, Charles-street, Middlesex Hospital, London—Improvements for laying subaqueous electrical cables for telegraphic communications.

3148. Christopher Nugent Nixon, Ramsgate—Improvements in attaching, fitting, and securing the rudders of ships, barges, boats, and every other description of sailing or steam vessel.

3149. Joshua Moss, Thomas Gamble, and Joseph Gamble, Sheffield—An improvement in the manufacture of cast steel hoops and cylinders.

3150. Charles Norron, 3, Lancaster-place, Camden-street, Camden-town—Carriage door shields to prevent accidents arising from the shutting of railway or other carriage doors, also applicable for nursery doors, or any other doors where children may have access, or where safety from accident may be an object.

Dated 24th December, 1887.

3151. George White, 5, Lawrence Poultry-lane, Cannon-street—A semi-melodion or instrument for demonstrating musical writing. (A communication.)

3152. Charles Reeves, Birmingham—Improvements in repeating or revolving fire-arms.

3153. Samuel Henry Adderley, of Birmingham—Improvements in the manufacture and ornamentation of pencil cases, pen-holders, reserves or cases for leads, needle cases, and ink-holders and other tubular cases.

3154. Thomas Playle, Chatham—Improvements in two-wheeled carriages.

3155. George Croft, Leas-street, Keighley, and Smith David Steel, Greengate Mills, Keighley, Yorkshire—Improvements in machinery or apparatus for combing and preparing wool and other fibrous substances.

3156. George Hurley, King's-cross-road, near Halifax—Improvements in apparatus for cutting the pile of fustians and other pile fabrics.

3157. Henry Charles Fenwick Wilson and Thomas Green, Dunston—A machine or apparatus for making rivets.

3158. Henry Charles Fenwick Wilson and Thomas Green, Dunston—Improved machinery or apparatus for making rivets.

3159. Benjamin Barleigh, 26, Great George-street, Westminster, and Frederick Ludwig Danehell, 452, Oxford-street—Certain improvements in the manufacture of vessels, plates, or utensils, used for domestic, sanitary, electric, and manufacturing purposes.

Dated 26th December, 1887.

3160. Alexander Chaplin, Glasgow—Improvements in steam engines, and in the combustion of fuel.

3161. Antonio Ribeiro Sariva, Nottingham-street, Marylebone—An improved candlestick or holder.

3162. Charles Frederick Parsons, 1, Duke-street, Long-alley, Finsbury—Cleaning and reburning animal charcoal.

Dated 28th December, 1887.

3163. Alexander Bruce, Manchester—Improvements in watches and time pieces.

3164. John Barling, Halifax—An improved paddle for propulsion on water.

3165. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the treatment and preservation of skins, furs, wool, and textile fabrics, and in the machinery or apparatus employed therein. (A communication.)

3166. H. Deacon, Widnes—Improvements in purifying alkaline lees.

3167. James Boydell, 65, Gloucester-crescent, Camden-town—Improvements in carriages propelled by steam or other power.

3168. James Wadsworth, Hazelgrove, near Stockport—Improvements in the production and management of artificial light, and in apparatus applicable thereto.

3169. John Thomas Griffiths, New Beaford, Nottingham—Improvements in the manufacture and ornamenting of lace.

3170. Isaac Holden, St. Denis, near Paris—Improvements in preparing and combing wool and other fibres.

Dated 29th December, 1887.

3171. Thomas Spencer, 198, Euston-road—Improvements in the purification of illuminating or lighting gas.

3172. Henry Thompson, Liverpool—Improvements in the application or use of a certain substance as a substitute for glue, paste, cement, varnish, and other similar compounds.

3173. John Hargreaves and Joseph Hargreaves, Liverpool—Improvements in winding up watches which have not fuses or chains.

3174. Alexander Parkes, Birmingham—Improvements in joining or uniting metals.

3175. Victor Mourot, 43, Rue de Paradis Poissonnière, Paris—Improvements in furnaces for heating kilns and ovens used in the manufacture of pottery and earthenware, part of which improvements are also applicable to furnaces generally.

3176. Edwin Gamers and William Mills, New York, U.S.A.—Improved composition for trains or safety fuses, and for other purposes.

Dated 30th December, 1887.

3177. Frederick Oldfield Ward, 12, Cork-street, Burlington-palace—Improvements in liberating or producing powder or both (as the case may be), from natural alkaline earths, the residuum of the process being available as material for manure, puzzolano, or hydraulic cement. (A communication.)

3178. William Henry Tooth, 9, St. James-street, South-west—Improvements in furnaces.

3179. Francis Palling, 134, Princes-road, Surrey—The control of candles, lamps, and candle-lamps, without wicks.

3180. Thompson Booth, Manchester—Improvements in the treatment of certain vegetable matters, and in the application of same to sizing, stiffening, dressing, and finishing of materials, and which is also applicable to thickening for printing.

3181. James Davis Morrison, Edinburgh—Improvements in the surgical and medical operations by the agency of solid induced anaesthesia.

3182. John O'Neill, Liverpool—Improvements in apparatus communicating between the guard or passenger and engine-driver on railway trains.

3183. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cutting corks and bungs. (A communication.)

3184. Richard Harmer, Union-street, Spitalfields—Improved cigarettes.

Dated 31st December, 1887.

3185. Carl Buhning, 91, Pratt-street, Camden-town—Improvements in the combination of carbonised and carbonaceous other materials, and the manufacture of such compounds into various useful articles.

3186. Henry H. Hanson, Stockport—Improvements in the method and finish of cotton-band, twine, rope, cordage, of fibrous substances, and in machinery or apparatus applicable thereto.

3187. Peter William Barlow, 26, Great George-street, Westminster—Improvements in the permanent way of railways.

3188. Augustin Julien Michel Ramar, 49, Broad-street, St. James's-square—Improvements in ornamental and painted cast-iron.

3189. George Wilson, Sheffield—Improvements in the construction of fire-places of steam boilers. (A communication.)

3190. William Middlestep, Grove-terrace, South-gate, London—Improved machinery or apparatus for boring and turning.

3191. James Long, Gorseston, Yarmouth, Norfolk—Improvements in the construction of sewers, and in the method of charging the contents thereof.

Dated 1st January, 1888.

1. John Henry, Friday-street—Improvements in washing for ladies' dresses and petticoats.

2. Louis Joseph Arsène Brun, Paris—Improvements in instruments for measuring angles, applicable to mechanical purposes.

3. George Gorie, Handsworth—A new or improved method for water-closets.

4. Alexander Parkes and Henry Parkes, Birmingham—Improvements in the manufacture of rods, wire, nails, and other articles.

5. John William Clare, Surrey-square—Improvements in engines and boilers, part of which improvements are applicable to furnaces.

6. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in penholders, pencil cases, and other articles, and of a like nature. (A communication.)

Dated 2nd January, 1888.

7. Robert Harvey, Glasgow—Improvements in steam engines.

8. Archibald Slate, Adelaide-road, Haverstock-hill—Improvements in apparatus for supplying fuel to blast furnaces.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Dated 1st January, 1888.

2. James Murphy, Newport, Monmouthshire—Improvements in wheels used on railways.

WEEKLY LIST OF PATENTS SEALED.

January 15th.	January 15th.
1999. Richard Bolton.	2026. W. Hudson and Co.
2041. Nicolas Saintclair.	2027. Charles Norris.
2165. Paul Emil Laviron.	2029. James Durrant.
2263. Alfred Vincent Newton.	2045. F. Ottensmeyer & T.
2317. William Edward Newton.	2161. William Edward Newton.
2324. William Edward Newton.	2305. Alexander Gray.
2690. Robert Atkinson and Thos. Brearey.	2507. William Edward Newton.
2923. Thomas Glover and Alexander Bain.	2583. William Edward Newton.
	2819. Henry Hargreaves.
	2849. Edward Halliday.
	2946. Antoine and Jean.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

January 12th.	January 12th.
85. Christopher Turner.	106. George Hargreaves.
95. Gustav Warnecke.	115. Jonathan S. Smith.
231. Henry Davis Pochin.	116. Jean Antoine F. J.
January 13th.	January 13th.
114. James Lee Norton.	123. Constant Jodrey.

Journal of the Society of Arts.

FRIDAY, JANUARY 29, 1858.

NOTICE TO MEMBERS.

Owing to a mistake on the part of the printer, enclosing a map in a portion of the stamped edition of last week's *Journal*, a charge of 8d. as made by the General Post Office; in consequence of which the *Journals* have, in many instances, been refused by the individuals to whom they were addressed. Steps have been taken, at the cost of the printer, to supply the *Journal* in each of those cases, so that there may be no break in the volume. Members who have not received their *Journals* should apply to the Secretary of the Society of Arts, Adelphi, London, W.C.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.
2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to the Society's House, Adelphi, London, W.C., carriage paid.

The days for receiving articles are, Thursday the 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief but clear description of the invention, with a wood-block (when possible) for illustrating the Catalogue, and a reference to any publication in which the Invention is described.

All drawings must be framed.

SPECIAL PRIZE.

A Prize of Twenty Pounds and the Society's Silver Medal, is offered for a Writing-case suited for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following points, which will influence the Council in making their award:—

- Lightness,
- Smallness of size,
- The avoidance (if possible) of fluid ink,
- Durability,
- Cheapness, with a guaranteed supply, and

General applicability to the duties, habits, and requirements of the above classes.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 8th May next.

EXAMINATIONS—LOCAL BOARDS.

A Meeting of the Secretaries of London Institutions in Union with the Society, was held on Thursday, the 21st inst., at the Society's House, convened in accordance with the resolution passed at the Conference held on the 11th inst. A Deputation from the Council attended the meeting, when it was resolved unanimously—

“That the Secretaries present having heard the explanations given by the Council in reference to the formation of Local Boards, undertake to report the same to their respective committees, and will, as early as possible, communicate to the Society of Arts whether they will appoint local Boards themselves or join others in the neighbourhood in doing so.”

THE SMOKE NUISANCE.

Members of the Society will be glad to learn that the award made by the Council in 1856, of the Society's Gold Medal to Mr. Charles Wye Williams, for his “Essay on the Prevention of the Smoke Nuisance,” has been confirmed by the Newcastle Coal and Colliers' Association, who have awarded to that gentleman the premium of £500 for an Essay on the same subject. The details of the award will be given in a future number.

There were one hundred and three competitors.

SIR JOHN SOANE'S MUSEUM.

The Trustees have given notice that the Museum, 13, Lincoln's-inn-fields, will be open this season as usual, on the Tuesday in each week, from the 2nd of February to the 31st of August, and likewise on Thursdays and Fridays in April, May, and June.

Cards of admission to view the same are to be obtained on written application to the Curator, at the Museum, or to either of the Trustees.

EXAMINATIONS.—FORMATION OF A LOCAL BOARD OF EXAMINERS AT BRIGHTON.

On Friday, the 22nd instant, a meeting for the consideration of this subject was held at the Town Hall. The desirability of forming such a Board at Brighton having occurred to some of the friends of education, a preliminary meeting was held in December last, which resulted in the formation of a Committee, at whose request a deputation from the Society of Arts attended at the Town Hall, to explain the nature of the movement. The deputation consisted of Mr. Wentworth Dilke (Chairman of the Council of the Society of Arts), Sir Thomas Phillips, Mr. Harry Chester, and Mr. William Hawes. There were present, in addition, the Mayor (J. C. Burrows, Esq.), Dr. King, Dr. Allen, Rev. S. R. Drummer

miners, in connection with the Society of Arts, be formed in Brighton."

Mr. SLIGHT seconded.

Mr. ANDREWS, Dr. KING, and Mr. J. ELLIS supported. Some conversation ensued, in the course of which Mr. Chester stated that several appointments in the Civil Service had been already placed at the disposal of the Society for 1858, and they might have others. In the department to which he belonged, under the authority of Lord Granville, eight or ten clerks had received their appointments in this way; there were none more conspicuous for intelligence, industry, and modesty, or who, in every respect, made better public servants. The resolution was carried.

Subsequently the meeting adopted a second resolution, adding Messrs. Savage, Bessant, Bridgen, Howell, and Sleight, to a Sub-Committee already formed, with a request that they would draw up a scheme for the formation of a Local Board, and submit it to a future meeting of the existing Committee, to which were also to be summoned the members of the Committees of the Royal Literary and Scientific, the Athenæum, the Mechanics', and the Railway Institutions, so that the Board might finally be established with the sanction of all the Local Societies.

The proceedings closed with votes of thanks to the Deputation and the Chairman.

EIGHTH ORDINARY MEETING.

WEDNESDAY, JAN. 27, 1858.

The Eighth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 27th inst., Peter Graham, Esq., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Burt, Frederick Valentine	Pieese, G. W. Septimus
Clay, William	Scott, Wentworth Lascelles
Hodgson, Rev. William	Underwood, John
Johnson, James	Watson, J. Forbes, A.M.,
Manning, Frederick A.	M.D.
Morgan, Thos. Vaughan	Waugh, John Neill, M.D.
Morgan, Wm. Vaughan	Young, W. Hill.

The following Institution has been taken into Union since the last announcement:—

453. Richmond (Surrey) Young Men's Institute.

The Paper read was:—

ON THE USE OF THE SOULAGES COLLECTION OF ITALIAN ART IN MODERN ART MANUFACTURE.

By J. G. CRACK.

I think that the subject I bring before your notice can be discussed in no place more appropriately than in this; and that it is also one peculiarly suitable for our consideration. In no possible manner can we more usefully advance the interests of art manufacture than by seeking to acquire collections of works that have impressed upon them the genius and the skill of men who lived at a time when Art abounded.

You may teach the rules of Art, which serve like grammar to a language, but, without examples, it will be difficult (perhaps with few exceptions, impossible) for students to arrive at anything like perfection in the arts of design by rule alone: "Longum iter per precepta, brevis ex officio per exempla" is indeed a true saying, inscribed by Lord Bacon in his house at Gorhambury.

I will preface what I am about to say respecting the "Soulages Collection" by a reference to Art Manufacture,

as it existed about the time that these examples were produced; for they are mostly of a period ranging from 1500 to 1600.

At this date society had just emerged from that chivalric barbarity which prevailed during the Mediæval period, which recognised the pre-eminence of brute force or military skill, rather than the refinements of literature or the arts. Commerce, too, that greatest of civilizers, now vastly extended its ramifications, and bringing wealth and more genial desires for comfort or luxury, caused a general appreciation of Art, and a greater desire for obtaining its productions. Then began to burst forth in Italy that revival of a love for Art which had almost slumbered on the dry rules of tradition for so long a period; and then successively arose those great artist minds that brought such glory upon their country and their time.

Nor was it the higher branches of art, Painting, Sculpture, Architecture, that alone were exalted; but the more ordinary objects of daily use were equally affected by this growth of art. Metal work, pottery, glass, furniture, woven fabrics, all became the medium for exercising the taste that abounded, and which was demanded by that love for art which had so strongly inoculated the minds of the people.

And what a strong spirit, what a knowledge of and love for art had this revival, this "renaissance" of art, produced! At no other time do we find such fancy, originality, and beauty, so abundantly exhibited in common things, as in the art manufactures of this period. Take up what specimen we may, we find something to admire and something to learn from. It is a period, of all others, valuable for instructing us in those fanciful combinations of ornamental art, a knowledge of which is so essential in art manufacture.

Most valuable to us, therefore, must be a collection of objects precisely of this kind, a collection affording characteristic examples of each branch of manufacture. Such is the Soulages Collection, of which I now propose to speak in detail.

You are aware that it consists of specimens of pottery, such as Majolica ware, enamelled ware, and stone ware; of enamels, of glass, of metal work, of sculpture, of painted glass, of pictures, of tapestry and woven stuffs, and of furniture; numbering nearly 800 pieces.

This collection was formed by M. Soulages, about twenty years ago, specially with the view of illustrating the arts of the sixteenth century, and more particularly those of Italy. He travelled to that country, and selected the specimens with great taste and judgment, under circumstances far more favourable than are likely again to present themselves; for the actual value of this class of art works is enormously increasing. It was known to many in England that this curious collection existed; and when an opportunity of acquiring it offered, it was justly considered that it ought to be purchased for this nation. Then, however, the energies of our Government were directed upon the Russian war, and Ministers could not bestow thought or money on this subject. Several lovers of art, however, met together, and guaranteed a sum of money which enabled them to purchase the collection, in the hope that in more quiet times it might be acquired by our Government for the public benefit.

The most important part of this collection is undoubtedly that comprising the specimens of Majolica ware, whether on account of their number (167 pieces), or their mercantile value. Of no intrinsic value for the material itself, which is generally of a coarse description, they are priceless for the art displayed upon them, and most curious as examples of the various processes employed.

Most beautiful are the delicate arabesques which are interwoven on their surfaces, drawn with such fancy and taste, and arranged so skilfully.

Look at them as the works of men who, of great tal-

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The collection of Venetian glass contains 90 pieces, remarkable for great variety of form and technical excellence in workmanship, evincing great originality and, particularly valuable to our workmen in giving very many examples worthy of imitation study; in fact, I fear that our working glass-blowers scarcely any ideas of artistic outlines, and have need of being familiarised with such forms as these. Our glass is beautiful in colour, excellently cut, and has been carefully got up, but how very little of it can be compared for form. Of late, however, I have noticed specimens which show great improvement in this respect, and our workmen have opportunities of seeing what is to be done. I doubt not they will soon appreciate it.

The manufacture of Venetian glass was carried on at Murano, an island adjacent to Venice, and here has been carried out all that is curious and beautiful in glass from a very early period, such as the *stipato* or *fiavio*, those delicate web-like spirals; the *trifido* or lacework glass; the millefiori eccentric pieces of various colours, also glass enamelling and painting. It was also here, if I do not mistake, that mirrors were first made.

Now we have to consider the specimens of enamels of various kinds, of which there are 25. These are mostly of the 15th and 16th centuries, containing historical subjects or portraits; some of them are of Limoges, and are very desirable, because the productions are limited in quantity and difficult to obtain. Till very recently this art of enamelling has been scarcely ever carried on to any extent for fine purposes in England, but I think it is a very beautiful and useful form of ornamentation, applied to metal work or furniture, and likely to be far more extensively employed than has hitherto been the case. Therefore, I say, collect good specimens of it, and let them present themselves, for how can workmen be instructed, unless you have examples to show them to be done.

The collection of ornamental metal-work number about 100, and give examples of brass and bronze casting, repoussé, and damascening of the Cinque-cento period. These are of a class meriting careful study by our artists and workmen, for this is a branch of art-manufacture in which we are sadly in want of workmen of the highest class, the nature of the process requiring that, as it comes from the mould, the finishing should be done by men who comprehend the intention of the artist.

The French bronze trade is of great importance. It employs a vast number of hands, and, by supplying an immense home demand, exports largely to every country where a love for art

prevailed in the fifteenth century were renowned for their artistic working in metal. Who has not read of Benvenuto Cellini, and been delighted with his enthusiasm he throws into all his artistic descriptions, and the vivid picture he gives of artist life in his day?

Several very fine specimens of Italian metal work are represented by photographs. Firstly, the door-knocker in bronze, said to be by Bolognese, in which the figures are so gracefully, so fancifully and artistically rendered. Brass ewers, alike elegant in form, and valuably displayed upon them by the engraver; ewers, too, covered with rich ornaments and designs; more precious even are the exquisite silver sticks, so elegantly ornamented with the designs of silver damasquinerie, worked, I think, in Moorish models.

Many objects of great interest, such as the great standing 4 feet high, rich in foliage and impressed with the arms of Barberigo of Padua, are clocks, inkstands, saltcellars, lamps, and various utensils, all bearing on them

the stamp of artistic minds, and most valuable as models for our study.

The collection of medals is particularly fine, and numbers above 100. An examination of these will show that the Italian artist of that day aimed at something more than a profile outline of a head; he gave it all the *crayon* features of a picture, almost the texture of the skin, a life-like look, well worthy of study by medallists of the present day.

The collection of furniture contains some interesting pieces, gems in their way, and several very curious, and useful for the suggestions to be derived from the study of them. At the time this furniture was made, people had not arrived at that appreciation of comfort and luxury which prevails at the present day; it must be studied, therefore, for its artistic quality and not servilely copied.

The furniture of houses in the fifteenth century was generally limited to objects of immediate use, such as the bed, tables, chairs, buffets for the display of plate, and chests more or less ornamented, and all of these constructed somewhat rudely. As the revival of art and literature extended its influence, the demand for ornamental furniture increased, and we find it constructed with more care, and men of talent in art designed it. Vasari tells us that Baccio d'Agnolo and his sons were celebrated as sculptors for furniture in the middle of the 16th century. Veneering, also, with rare woods was now introduced, and the re-invention of Tarsia work, or marquetry, as we now call it, allowed of very beautiful ornamentation.

This Tarsia work is the inlaying of various woods in ornamental forms, and Vasari informs us that Giuliano and Benedetto Maiano were renowned for this kind of work, and which was brought to a higher degree of perfection by Giovanni di Verona, who invented processes for shading and staining the woods.

All who visited the Soulagues Collection must remember the three mirror frames represented in the photographs. What an example of art work is that circular frame said to have belonged to Lucrezia Borgia; how admirable is the carving of the delicate scroll blended with figures and animals typical of good and evil. Then the square frame mirror of such fine artistic design and masterly execution. And, thirdly, that elegant frame fitted to a stand so simple and beautiful, so exquisitely detailed in the carving. This belonged to the famous Malatesta, Lord of Rimini. Such works as these inspire an art workman to rise above common things, to be dissatisfied till his hand acquires a higher touch of art than it had before.

There is another mirror frame in ebony of refined and quiet taste, inlaid with lines of ivory gracefully interlaced. The series of chairs is very curious, particularly the folding X chairs of the ancient curule form. Several of them are represented in the photographs. They approach very nearly in style to the gothic, but the transition to more modern ornament is perceptible. There are four other chairs of this form which are remarkable for their beautiful inlay in geometrical mosaic work of ivory and light woods on walnut ground, and are wonderful for their perfect finish and workmanship. They must have belonged to one of the Dukes of Urbino, as the device of that family is represented on each of them.

There are many other chairs of various designs, some very peculiar in form and elaborately carved, as can be seen in the photographs, which also give the designs of the two richly carved coffers or chests, such as it was usual in those days to present to a bride with her *trousseau*. These coffers were generally the work of sculptors of repute. I refer you to the photographs for representations of various tables, buffets, dressoirs, and cabinets, more especially the one numbered 690, which is ascribed to Bachelier, a sculptor and architect, of Toulouse, of about 1550, who had a great reputation for works of this kind, and is said to have been a pupil of Michael Angelo. This cabinet is highly decorated, and is ornamented with inlaid woods.

I must not omit to mention the superb lantern, from

ation of this kind came within the means of attainment. The result of the proverbial tardiness and reluctance of our government in matters like this, was that English people were charged with being destitute of taste. It was true that the country at large possessed two-thirds of the most valuable pictures in the world, but it was difficult to convince the English government of the necessity of securing such things as they lay within their grasp, and on many occasions the most valuable specimens of art had been allowed to pass into the hands of other nations. Mr. Farrer then alluded to the Elgin marbles. When this was made known, it was argued that such fragmental things could be of no use in the promotion of art, but it was now acknowledged to have been one of the most valuable acquisitions made for the country. Sir Richard Westmacott, in answer to an objection taken by a member of the then committee, that such broken specimens could be of no use to the sculptor, said that it was from these fragmental pieces, when combined and regarded as a whole, that the best works had been produced. He thought, in a case of this kind, it was the working man—the artisan—who ought to be mainly considered. The acknowledged superiority of the French artisan, in taste and execution of design, had been commented upon in the past, but the French would not have taken the lead in matters of taste if it had not been for the Louvre, the Vatican, and the Luxembourg. At every turn in the history of art, some object of beauty in the arts was presented to the eye, and the artisan unconsciously caught the true spirit of those works, and carried it out in his productions. The artisans of this country required no special teaching from government; all they required was the opportunity of studying really good models in marble, and he thought it was the duty of a parental government to provide such museums. In every continental country with which he was acquainted, the government recognised the importance of providing means of artistic instruction for the people, and why should England be behind them? He strongly advocated the purchase, by the government, of the valuable collection of specimens of art which had been so ably referred to in a paper that had been read.

Professor DONALDSON thought they were deeply indebted to Mr. Crace, as a manufacturing artist, for having alluded to the influence which this collection would have upon the artisans of this country in producing models for the ordinary purposes of life. There was no doubt that we were greatly in want of really good models, and it was only by multiplying these that the artisan could be taught to apply the skill which he naturally possessed. It was useless to refer the artisan to nature alone. He must have principles to guide him. It was not enough to place before him mere leaves and animals; it was necessary that the art element should be infused into his productions. Mr. Crace was therefore quite right in saying that examples were required in order to produce a good school of art. It had been the object of France and other continental nations to introduce the finest examples into their schools of art, and hence the French had acquired their pre-eminence in artistic design. The French artist was brought under an organised system of education and training for his profession, and thus acquired the elementary knowledge and manipulatory skill which enabled him to attain such mastery in his art. He thought it was mainly owing to the schools of art maintained in France that the French artist was enabled to excel in the styles of various periods. Unless the workman was instructed upon true principles he could not produce works which would stand the test of ages, although he might satisfy the passing passion of the day. The works before them which were now so much admired, had also received the admiration of Popes, Cardinals, and Princes of Italy. Would that a similar love of art existed among our ministers in the present day. Some striking statistics had been quoted

by Mr. Crace, showing the bearing of this question on our export trade in art manufactures. It was true there was a substantial character and an excellence of material in English manufactures, but the superiority of design and tasteful manipulation of the French productions, gave them the preference in the market, even at the sacrifice of real utility and excellence of workmanship. Manufacturers were obliged to go to the expense of providing their own models, and the opportunities of obtaining really valuable ones were extremely rare. If the government allowed this opportunity to pass, and permitted this collection to become dispersed, he thought it hardly possible to collect again such a number of splendid examples in various classes of art as were contained in the Soulages Collection. It would seem that our government could not appreciate the value of placing before our artisans first-class examples. They authorised their agents to go to only a certain amount in the purchase of specimens of art, and so the first-class articles were secured by private persons or foreign nations. It was remarkable how many continental towns had become great and celebrated merely from the perfection to which a particular class of manufacture had been brought there. It was true that many of the most beautiful specimens in this collection were of a class to serve none of the useful purposes of life, yet, as examples of art, they were invaluable. It might be that some of our great manufacturers were rich enough to procure a few specimens for the study of their workmen, but it was found that unless they had a large variety, a sameness of style would prevail in their productions. On these and other grounds he considered it was of the first importance that the Soulages Collection should be secured to this country, and he hoped the public would express this opinion so strongly as to give confidence to Lord Granville in urging this matter upon his colleagues.

Mr. RICHARD MOORE said that, as a working man, he would urge the desirability of purchasing this collection—not for any special benefit that it would confer upon those similarly employed to himself, but because it would in some degree afford to the artisans of this country those opportunities which were enjoyed to a much larger extent by their brethren abroad, and would serve to develop the powers which he believed to be inherent in them. They must be aware that a few years ago there was great paucity, in this country, of examples worthy of study as works of art, and formerly the artisan was almost entirely shut out from every kind of art exhibition. Nothing appeared so desirable as to starve the mind of the working man, so that he should really possess no information on the subject of his handicraft. When the late Mr. Hume and other philanthropic members of the House of Commons exerted themselves to open the cathedrals to the public, and to add to the museums as well as to open them for a longer time, there seem to be a general disbelief on the part of the educated classes as to the value of those institutions to the working community, and it was not until the late Sir Robert Peel joined in that movement and gave it the sanction of his authority that anything practical was done in that direction; it was not until he had avowed his opinion that valuable works of art were not so much in danger of injury at the hands of the artisan as from those of the vulgar rich, that the national exhibitions were opened to the working man. In the branch of manufactures with which he was connected, they had an association, in which a small endeavour had been made to collect a library of ornament and specimens of castings which they believed to be valuable in their occupation, but their efforts only served to show how feeble were the exertions of a few individuals, in comparison with what the government of the country had the power and means to effect, if those means were only judiciously applied. No one would desire that the government should launch into an extravagant expenditure for these objects, but the manufac-

the Gradenigo Palace at Venice of cinque-cento work of boldness of careful study.

The series of tapestries are of early date and uncommonly embroidered hangings are very few and deserve particular notice.

There are various other things which I think I ought to mention but I am fearful of boring you with a mass of things. I cannot, however, allusion to the carved woodwork, which I think, considered the best of the Georges Collection. Its height is 7 feet 6 inches high, and is decorated with foliate consoles supporting an Entablature, its middle filled with a series of figures, all executed with great skill.

Now all the fine things thus imperfectly required for the completion of the most important provincial towns. Lodged in a mansion, they are well off, and as a manufacturing trade they are, therefore, of value.

A national standard of the words of the most le plus.

Taking of value, but not colonial in 1855 :-

Furniture
Bronze
Paper
Silks ...

And
ornaments
I fear
against
But
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vermilion
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for room that they were at a loss how to dispose of the late importations from Greece. Mr. Crace suggested that there was plenty of room

to rejoice to see a good museum in London, also one at Wapping, but the idea of a museum for three or four millions of people was not feasible, as it required five or six museums, and he thought it would be a good museum at South Kensington, so that the National Gallery would be enlarged. He desired to see a museum of the kind, and they had a valuable collection of which he hoped would be retained. After all, he thought people would go to the greatest attraction, regardless of the locality. They found that large numbers of people visited the Crystal Palace, notwithstanding its distance from London, solely because it was attractive to the public (Mr. Cole) were free to act, and had it been at his disposal, he would establish a museum of the parks, which possessed natural attractions, and he thought there would be no fear of the future.

Mr. Crace expressed a hope that, if this collection were placed in the hands of the public, it would be placed in some place where the artisan could have the benefit of it. He thought the superiority of French productions over those of the English. The reason for this was, that there were constantly objects of beauty which the artisan could study and admire; the Louvre, the Luxembourg, and the Luxembourg were always open to the public. What they wanted was similar advantages in this country.

Mr. Farrer remarked that the important part of the result was, how the result which was so unanimously arrived at, namely the possession to the public of this collection of works of art. He hoped that the expression of the feeling of the present meeting would be made to the proper authorities, so that for the consideration of £15,000 so truly valuable a collection would not be lost to the country.

Mr. Crace said it now became his duty to propose thanks to Mr. Crace for the paper he had read. He thought there could be no doubt as to the necessity of using all the means in their power for improving the state of the country, and he quite agreed in the fact that there was great room for improvement in the minds of the upper classes. One great difficulty at the present time, with regard to art manufactures, was the taste of those who were the purchasers of the same. There was little difficulty in getting really good work executed when there was a demand for them. The superiority of French art production was due to causes too numerous for him to mention, but he did not doubt our great deficiency in this respect was first and foremost the establishment of Schools.

That was followed by the Copyright Act, which, however, had proved very inefficient for the purposes for which it was passed, inasmuch as the period of protection which it afforded to manufacturers for purposes was three years, and not only six or three months. The system of these matters in France was extremely different in this respect he thought we should do well to learn from our neighbours. In France the right in a design was secured to the designer, and if anything similar was copied by any other manufacturer he must be liable to produce an original design. This was the extensive employment of modellers in the reverse of that practice existed in this country, a manufacturer never thought of employing an artist if he met with a design already suited to his purpose. Hence there was comparatively little payment for artistic workmen in England. It was, therefore, from the tone of the meeting that it was unanimous on the subject of the

desirability of securing the Soulages Collection to the country, and indeed, amongst intelligent men, he thought there could be no difference of opinion upon that subject. Drawings were very good as far as they went, but those who had any experience in manufactures were aware of the inferiority of drawings in comparison with models. In order to make schools of design effective, they must also have museums of art manufactures.

A vote of thanks was passed to Mr. Crace.

Mr. Crace's paper was illustrated by numerous specimens from the Soulages Collection, kindly lent by the Committee of the Manchester Art Treasures Exhibition, as well as by a series of photographs, representing all the principal specimens. These will remain at the rooms of the Society until Tuesday next, for the inspection of members and their friends.

The Secretary announced that on Wednesday evening next, the 3rd February, a paper by Mr. Robert Rawlinson, "On House Accommodation—its Social Bearing, Individually and Nationally," would be read. On this evening the Earl of Shaftesbury will preside.

The following letter has been received by the Secretary since the meeting:—

DEAR SIR,—Several points arose during the discussion last evening, on some of which I wish to offer one or two observations.

The most suggestive and popular exhibition ever held within our walls, was probably that to which Mr. Farrer alluded in the course of his speech, and to which he himself so largely contributed, and in the careful management of which he took so important a part. That collection of objects of mediæval art was the origin of much of the taste for this class of historic art which has since so largely and usefully prevailed. To it we probably owe the interest which the Soulages Collection has so extensively excited, and the anxiety so universally expressed that one so unique and valuable should become public property. Under these circumstances it is certainly much to be regretted that our government should hesitate to purchase it, but I am not one of those who attribute that hesitation to either ignorance or indifference. It is the result of those discussions which always take place in the House of Commons when any vote is proposed for material educational apparatus. The fault is with us—the people. We send representatives to parliament who cannot understand or appreciate objects of art, and who think they are obeying the behests of their constituents when they object to furnish funds for the purchase of collections like this. The remarks made by some of our skilled workmen during the discussion afford additional evidence that they really understand the matter much better than many of those who affect to represent them.

Looking at the question simply as one of Political Economy, on which statesmen ought to be well read, national collections of art should be promoted. Anything which tends to improve the public taste, profitably occupies the time and faculties of producers, by the ordinary process of demand and supply. But, besides this consideration, which was so fully and ably descanted upon by some of the persons who took part in the discussion, we ought to know that anything which attracts foreign visitors to our cities, is so much gain to the national revenue. I am of opinion that the works of art, the museums, and the splendid buildings which so largely abound in Paris, Rome, Florence, Munich, Dresden, and elsewhere on the continent, are ultimately paid for by the innumerable foreigners who are tempted by them to spend time and money in their contemplation.

I cannot but hope and believe the ventilation of this question last night by Mr. Crace and the competent authorities in the room who supported his views, will lead to the preservation intact, and for national purposes, of the Soulagés Collection.

I am, &c.,

January 28, 1868.

THOS. WINKWORTH.

SEWAGE OF LONDON.*

By HENRY ALLNUTT.

Amount of Sewage per Head of Population.

In the report of the Metropolitan Drainage, page 15, we find it stated there are 15,249,777 cubic feet, or 95,311,106 gallons of sewage passing off daily from 75,251 acres, or 117½ square miles, the area of London, and that the population being taken at 2,656,000, it gives 5·8 cubic feet of sewage per head.

Now, 5·8 cubic feet is 36 gallons, and treating this as the amount of sewage for each individual in the population is really monstrous; if we approach the London sewage question in this way, and adopt these figures, it cannot surprise anyone that we are confounded, and utterly at fault to control and apply such a body of liquid to agricultural purposes. The mere drainage alone of 75,000 acres of land, or, as the referees recommended, 226,000 acres of land, in the matter of rainfall and spring water, without a particle of sewage, would be no light undertaking, but when we add the sewage to the water, and then propose to pump up that sewage and water from a considerable portion of this area daily (nearly 24,000 acres), and convey this with the water and sewage that flow down by gravitation from the remainder of the area (24 miles) to the sea reach, we have a task, indeed, before us, enough to tax human powers a thousand times more seriously than the launching of the *Leviathan*. But, I ask, wherefore the necessity of such an undertaking—why touch this mass of water? I contend that there are two distinct objects to deal with in what is called the London Drainage, which as long as they are blended together will defy the ablest intellect, but when separated will be, individually, easily manageable.

The first object is to drain the present area of 60 square miles, or, adopting Mr. Bazalgette's figures, 117 square miles, of the rainfall and spring water, into the Thames, and we may add to this the water that is thrown into the kitchen sinks of dwelling houses; for this latter is, at most, but dirty water, and would never prove offensive if allowed to run into the Thames with rain or surface water. No one can argue that this water from the kitchen sinks is of any agricultural value, or worth the expense of collecting. The most direct course should be adopted for the removal of all this rain, and, what I may term, harmless water, to the river. The present sewers, as far as they go, answer this purpose, no doubt, in the lowest situations. The mouths of the sewers should either be rebuilt with large sectional areas for a greater discharge of water during low tide (see the extract from Mr. Giullt's Report, page 315, in the Referees' Report), or an intercepting sewer could be formed to catch the water from the higher ground, and thus make the discharge continuous at all tides.

The second object is to remove the really offensive portion, and I believe that instead of 36 gallons per head, two gallons would be an ample allowance for each individual, and this should not be permitted to run into the Thames. To show how reasonable I am in saying two gallons, I find in the said Report (pages 51 and 52) that each adult voids, on an average, 46 oz. per diem (40 oz. urine, and 6 oz. feces). Let this be considered 8 lbs. As two gallons of water weighs 20 lbs., we shall still dilute the excrement with nearly six times its weight of

water, viz., 17 lbs. In properly constructed water-closets, it is found that only 6 pints of water is employed each full lift, and therefore I submit that 16 pints is a sufficient allowance to each head of population, and will even allow for water from certain manufactories, &c., when we remember we are calculating as though the 2½ million of inhabitants were all adults, which of course is not the fact. Now if the present sewage, with nearly half of the cesspools not yet abolished, is worth 2d. a ton, and we reduce it to one-eighteenth of its present bulk, the value of the sewage will be more than 3s. per ton. Any fertilising properties that may escape in the washings of the streets will be far more than compensated by the additional water-closets which have still to be provided for 140,000 houses.

I may here observe that some parties place an agricultural value on the water that is poured down the sinks of dwelling-houses, and also from the washings of the streets, as above alluded to.—First, as to water running down the sinks; it really is nothing but dirty water, from the scouring of pots and rooms—slope from the bedrooms are thrown down the water-closets, not into the sinks; however, a short code of regulations could easily be drawn up and circulated amongst the inhabitants. It would be directly to their interest to pay attention to these orders for the sake of the income derived from the sale of the sewage, and consequently the lightening of the parish rates. Secondly, as respects the water from the streets. If scavengers do their duty, and remove the mud and dirt daily, there really cannot be anything left in the mere washing of the streets, worth collecting and removing to any distance for agricultural purposes. We must be content to stop somewhere. It might also with some reason be said that pure clean water is useful for irrigation, which is true, but it would not pay to collect it day by day all the year round, and convey it to farms some miles distant. The question is, which course is the best to adopt; to run all the sewage of London entirely to waste into the sea, or to separate and retain the most valuable portion and allow the waste to flow into the river. If we attempt to utilize the most valuable part of the sewage, it is within our power, but when we endeavour to make use of the present bulk of sewage, we are overpowered; our motto should not be all or none—there must be some waste in every operation, and after all, the water, if separated from the real sewage, will perform the duty of scouring the river.

The person holding the office of Inspector of Nuisances could regulate the manufactories, stables, cow-houses, and slaughter-houses, and see that proper steps were taken to make the communication either to the rain-water sewers or to the real sewer pipes. As a case in point, I maintain that the water which runs from the breweries should flow at once into the river, as also the condensed steam from steam-engines. On the other hand, urinals, stables, &c., should discharge into the sewage proper pipes.

In page 20 of the Report, the referees state that "they have carefully observed the condition of the London streets, and that the water which flows from them, especially in rainy weather, contains foul organic matter to a serious extent." A more particular attention on the scavengers' part would, in a great degree, remedy this evil, and rainfalls are only occasional. With respect to their other remarks upon the rain-water pipes being used as soil pipes, and gutters in many of the inferior streets receiving every night large quantities of urine and other offensive matter, these evils might be, to a great extent, removed by the erection of proper water-closets.

Disposal of the Real Sewage.

We now arrive at that part of the subject which refers to the treatment of the sewage, supposing the plan is adopted for bringing it into a much smaller bulk. I am still of opinion that London should be divided into districts, and that the sewage proper should be run into a

* Continued from page 106.

reservoir, or, say two receptacles, in case an unforeseen difficulty arises to prevent its being removed immediately. It now becomes a question as to whether it should be deodorised or removed from the reservoirs to the land as quickly as possible. I do not attempt to decide this question, but I may say that if the former course is followed it will necessitate a great outlay for the chemical or charcoal without a correspondingly increased value to the sewage. I think my plan of removing the sewage in closed railway trucks (wrought iron) might be carried out. We have information in the Report, that the sewage is conveyed from some towns in pipes, but as respects the London sewage, I think the distance into the country would be too great, and it appears to be a fact that pipes are liable to be clogged or filled up (see Report, page 475); therefore I consider that the better plan would be to convey the sewage in closed railways trucks on a line of railway to the neighbourhood of the farms requiring it. A consideration now arises as to which will prove the most economical method of filling the trucks, whether by forming an incline way down, to below the reservoirs, and so permitting the sewage to flow by its own gravity into the trucks, or by pumping up the sewage from the reservoir into the trucks. I conceive there are many objections to pumping; first, the ordinary kind of pumps is not adapted to raise sewage (see Report, page 38-389), and if screw pumps or scoop wheels are employed, it may require two or three lifts; secondly, the denser parts will always be settling at the bottom of the reservoir, and to prevent this the sewage must be agitated during pumping by forcing in air at the bottom of the reservoir, or by other means. This will have a tendency to increase the nuisance; the more it is disturbed, the greater will be the emanations from the sewage. On the other hand, if trucks are filled direct from the reservoir, the latter could be formed like an inverted cone, and the sediment would be the first matter to flow into the trucks. I would counter-balance the weight of the truck by having an empty one descending as the loaded truck was being drawn up the incline, so that the power would only be exerted to draw up the sewage. The trucks, if constructed of wrought sheet iron, (perhaps old boiler plates might be used) somewhat in the shape of an inverted cone, discharging from the bottom, could be made to hold about 6 or 8 tons, being 1344 or 1792 gallons. A truck 12 feet long, 6½ feet wide, and 4 feet deep inside in the clear, would hold nearly 8½ tons or 1950 gallons. Now, if there are at present 95,311,106 gallons of sewage daily, and we reduce it to $\frac{1}{4}$ = 5,295,061, and divide this amongst 10 districts, it would give 529,506 gallons to be removed from each district daily, and, lastly, if a truck would contain 1,900 gallons, it would be about 280 truck loads a day, or under 12 loads an hour. If we have 20 districts instead of 10, the result would be only 6 truck loads of sewage an hour to remove, which could be deodorised or not, according to circumstances. With respect to the cost of conveying the sewage into the country, I think when a large quantity would have to be regularly removed, it might be done at 4d. per ton per mile. Supposing we wished to convey it to Acot Heath from Walham-green, near the West London Railway, the distance round by Hounslow would be about 26 miles. The cost of one truck containing 8 tons of sewage would be as follows:—Sewage at 3s. per ton, £1 4s., carriage 4s. 4d., total, £1 8s. 4d., or 3s. 6½d. per ton. I cannot enter into any estimate of the expense of working the plan, of the wear and tear, or of the cost of the railway rolling stock, but I think it is quite evident that the value of the sewage would be such as to be well worth the expense of these works for its removal and application to the land.

The cost of removing the sewage and rain-water to the sea is estimated at upwards of £5,000,000, but this amount might be found insufficient, and, indeed, may be doubled, taking into consideration the magnitude of the proposed works, and their peculiar nature; whereas, the

mere laying down another set of sewers to the water-closets, is no uncommon work, and I beg to throw out the suggestion that there is no real necessity for having the sewers for the water-closets so deep or so low as the generality of the present sewers. The water-closets are not often situated in the basement—there is no necessity that the water-closets should be placed so low in a house. Mr. Bazalgette is stated, in page 21 of the report, to have estimated the cost of draining London in this manner at £10,000,000; £5 a house, for 300,000 houses, would give £1,500,000, but if it amounted to double this sum, you would have a set-off in the value of the sewage, which is stated in the report (page 752) to be £1,444,000 per annum, but nothing whatever of a reproductive nature will arise from the expenditure of £5,000,000 to cast the sewage into the sea; indeed, the estimate is still greater than this when we include the covering of the main channels, which expense is not estimated or provided for in the Referees' Report.

I have only one other observation to offer, and that is, has it thoroughly been investigated, what effect is likely to take place from the abstracting 15,000,000 of cubic feet of sewage daily (the present amount) from the Thames; would not the river, in consequence, be much lower at low water and the bed more exposed, especially when we take into consideration that by the plan of the referees it is contemplated, when the sewage flowing in the main channels in dry weather becomes too low, to let a considerable body of the Thames water into the main channels, to keep up the uniform depth of 16 feet. I, therefore, repeat, when not only the 15,000,000 of sewage, but also a great body of water (the amount of which is, I believe, not even estimated in the report) will be actually abstracted from the Thames (in the driest season of the year) to assist the flow of the sewage in the channels, there is great reason to fear that the effect on the river will be very serious, in fact, the volume of water will be most materially lessened; we may say that the supply of fresh water will be almost cut off or turned aside from the river in dry summer weather.

From all these remarks it will be seen that we may well hesitate in adopting the scheme for removing the sewage, &c., to the sea, by works of such magnitude, which are even already admitted, in the very outset, to be insufficient in heavy rainfalls; and let us hope that means will be found to remove the really offensive part of the sewage, and deal with that alone, not with a view of casting it into the sea, but of applying it as manure for the land. The supply of guano is not, and, indeed, cannot be unlimited, and a man would be truly considered an enemy to mankind who wasted the gifts Providence had placed within his reach. No one but a madman would cast away his capital, and what else is manure to an agriculturist, the most valuable he possesses, without which he cannot flourish—he may plough and he may sow, with the greatest care and diligence, but without food for the plant how can he expect to reap a rich harvest, nay, he may reap, but what has he worth cutting, if the land has not received its proper dressing of manure; and as steam cultivation is beginning to make itself apparent, manure will be in still greater demand; this, I think, cannot be denied. True, it may be urged that though London may throw all its valuable manure into the sea, this would be no reason why all the other towns in England should waste theirs also. Perhaps not, but the metropolis will be setting a very bad example, and future generations will point at the folly of the present generation, and wonder how men could be capable of throwing away so great a treasure, whilst the smaller towns turned their sewage to a useful account. It may be quite true that in Leicester, or some other towns in England, they may not have arrived at the best plan of utilising the sewage, but, depend upon it, if one way will not answer, another will be discovered. In the present scheme for the drainage of London, we not only do as much

mischievous as we are able with the sewage of the present day, but we go ahead, and in our plans provide for casting into the sea, and thus wasting the sewage when London is double, nay, four or six times the size it now is. It is somewhat like a man who is not content with injuring his estate during his own life, but he needs must leave behind him a perpetual charge to drain the estate, ever after, of a great portion of the profits. The sewage of London should be separated from the rainfall and mere dirty water; the former should be looked on as a mine of wealth, and cared for accordingly, whilst the latter should be carried off to the river by the present sewers. Let us express a fervent hope that common sense will prevail.

SOUTH KENSINGTON MUSEUM.

During the week ending 23rd January, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,788; on Monday, and Tuesday, (free evenings), 3,821. On the three students' days (admission to the public 6d.), 775. One students' evening, Wednesday, 57. Total, 8,441.

Home Correspondence.

LORD PALMERSTON'S MORTAR.

SIR,—In the *Journal* of the 8th January, Mr. H. W. Reveyer, in noting the partial failure of the monster mortar known as "Lord Palmerston's," lays before your readers a plan of his own for constructing what he considers "indestructible ordnance," his plan being as follows:—"To construct all large ordnance with a soft steel spiral bore of sufficient strength to resist the explosion, upon which should be cast a metal jacket of brass or iron."

In the first place, the welding of such a mass of steel is open to serious objection. Steel being a metal so easily destroyed by heat, even admitting that the welding could be satisfactorily performed, the cast "jacket" would most assuredly destroy it; indeed, I attribute the failure of Krupp's steel gun to the cast iron "jacket." By running a fluid metal around the bore, the outer surface would be brought into, and kept in, a welding state, and the cohesive power of the metal materially weakened if not altogether destroyed.

Matured cast-steel has a cohesive strength about seven times greater than cast iron, but the strength of crystallized steel is not equal to that of cast iron.

I speak of crystallized steel, because I am of opinion that casting a "jacket" of cast iron or brass around the steel gun would bring it up to, and for some time keep it at, a welding heat. This would induce crystallisation, and I fear, in that Mr. Reveyer would not find his ordnance really "indestructible." Then, again, the shrinkage of steel being greater than that of cast iron, a space would be left between the "jacket" and bore. I consider the plan defective even for light ordnance, having, at the end of 1846, constructed a small cannon of malleable iron and steel, the bore being made of the strongest mild cast steel, cast hollow, and hammered on a mandril (it was cast hollow to save welding), to bring the particles into the closest possible contact. It was then heated to a low white heat, placed in the moulding box, and liquid malleable iron poured round it. After finishing, it was submitted to the following tests; first charge, 7 oz. of powder, a conical malleable iron ball weighing 9 ozs., and a wad, second charge, 4 oz. of powder, two conical balls, 1 lb. each wad; afterwards with 8 oz. of powder, three conical balls, 1½ lb., a wad, and filled up to the muzzle with waste iron waste, which was driven home with a sledge hammer. This latter charge was repeated several times, when it was found that the steel had split longitudinally from the muzzle for about three inches. I

have no hesitation in saying the cannon would have gone to pieces had not the iron been so strong. A gun barrel made from the same iron in the usual way, in Birmingham, stood respectively 7, 14, 21, and 28 drachms of powder and a conical ball, and burst with 35 drachms and a conical ball. 7 drachms is a proof charge, and 24 a service charge.

I am, &c., W. HAWKSWORTH.
Aston Street and Iron Works, near Linsithgow,
January 14th, 1858.

REGISTER OF RAINFALL.

SIR,—I am disposed to agree with Mr. J. Bennett, Lawer as to the greater accuracy of the larger rain gauge. Of the three which I assisted in registering hourly for upwards of five years, in one of our colonies, I preferred one of the following form:—A funnel-shaped receiver, three feet square (9 square feet), surmounts a box of metal, accurately made, down the side of which is fixed a barometer tube, bent at the bottom, and inserted into the box. The area of the receiver and the contents of the box were calculated, and verified by actual measurement with water.

On falling into the receiver and passing into the box, the water rises in the barometer tube. Water is kept in the box up to a low point in the tube, marked zero, and the length of the tube is painted in terms of the inch on the outside of the metal box. By this means, depending on the relative proportions of the box and receiver, the smallest quantity can be seen at a glance. The neck of the funnel-shaped receiver is to be made small, to prevent evaporation. A small cock at the bottom of the metal box furnishes the means of emptying it. The height of the surface of the gauge above the ground, and the nature of the stand or support, will depend on circumstances, but, of course, the former is an important scientific element in the results.

I am, &c.,

T. E. W.

AGRICULTURAL IMPLEMENTS.

SIR,—On reading a letter to you, published in the *Journal of the Society of Arts*, Dec. 25th, 1857, headed "Agricultural Implements," by Mr. William Waller, of Uddington, I would merely beg to remark that I was witness to an acre of beans being cut in an hour, by a machine impelled by a pair of horses and guided by one man, in the Carse of Stirling, as far back as the year 1812.

It was the invention of the late James Smith, of Deanston, a name well-known to most agriculturists and machinists.

A model of this machine may be seen in the Hunterian Museum of the University here.

I am, &c., JAMES BUCHANAN.

40, St. Enoch's Wynd, Glasgow, Jan. 11th.

P.S.—I fancy some are still to be found in the Carse of Stirling of this kind, as subsequently improved by Mr. Smith, ere he left Deanston.

Proceedings of Institutions.

BIRMINGHAM.—Mr. Toulmin Smith recently delivered an interesting lecture on "The Fairy Mythology of England," in the theatre of the Midland Institute. The lecturer, who was introduced by Mr. A. Ryland, commenced by observing that mythology, which was the most early association connected with man's history, was full of belief. He should confine himself on that occasion to the popular fairy mythology, as derived from our Scandinavian forefathers, which was more poetic in its parts and nobler in its spirit than the mythologies of Greece and Rome. It was not handed down to us in our own Anglo-Saxon tongue, owing to the early introduction of Christianity; but it was perpetuated in the old written tongue of the North. The lecturer then quoted

a translation from the original language of a poetical account of the creation of the "alfs," or elves, as they are now more familiarly designated. Glancing at the legend of Thor having obtained his renowned hammer from the alfs, the lecturer next referred to the great swordsmith, Wieland, who was supposed to have resided in the White Horse Valley, Berkshire, and whose fame had been immortalised by Sir Walter Scott, in his romance of "Kenilworth," and was casually alluded to in a note to "The Lady of the Lake." Mr. Smith illustrated this portion of his subject with translations from the Runic legends. He next dwelt upon the achievements of Beowulf, the parent of knight errantry, and then proceeded to speak of King Arthur. The fullest details respecting the elf-wrought armour of Arthur, were to be found in an old Saxon ballad, descriptive of the monarch arming for battle. This he recited. He then referred to Merlin, who was said to have conveyed Stonehenge over from Ireland to Salisbury Plain in a single night; and who worked in a cavern underneath it, but having fallen in love with the "Lady of the Lake," she placed an enchanted stone over the entrance, and thus gave rise to the tradition that he and his assistants could be heard working at night with their hammers and anvils. Having quoted from the writings of Drayton, who lived two centuries ago, and a ballad composed on the occasion of the visit of Queen Elizabeth to Kenilworth, in 1575, in exposition of this legend, he described Arthur's fairy death in the Lake of Avalon. He, however, ignored the assertion that the history of Arthur was fabulous, and maintained that faith should be placed in the existence of "the Celtic hero." Having observed that time would not admit of his introducing, as he intended, the stories of Guy of Warwick and the destruction of the great boar, and St. George and the Dragon, Mr. Smith pointed out that in the whole range of Old English poetry there was no description of Elf-land, but merely vague and shadowy references to it, in support of which argument he quoted selections from Spencer and Chaucer. He remarked that the Scotch bards in this respect differed from those of England, adding in corroboration a passage from the romances of Thomas the Rhymer. In conclusion he laid down the principle that the northern mythology must not be regarded as having any association with witches and witchcraft, the former being founded on belief, and the latter on superstition; and he closed his lecture by contrasting two old poems, descriptive of the wild orgies of the witches, and the gambols of the white elfs by moonlight. The lecture was listened to with much attention.

CROYDON.—The annual meeting of the Literary and Scientific Institution, was held on Wednesday, December 2nd, 1857, Thomas Farley, Esq., President, in the chair. The honorary secretary read the last report, which shows that progress has been made during the past year. The number of members during the first quarter was 301, during the second quarter 478, during the third quarter 633, and during the fourth quarter 333. The total income of the Society for the year was £336 13s. 11d., and the expenditure was £266 3s. 8d., showing a balance in favour of the Institution of £70 10s. 3d. From this, however, has to be deducted a sum due to the treasurer, so that the actual balance in favour of the Institution is £46 1s. 11d. The lectures which have been delivered during the past year have been of a varied and attractive character, and the attendance has been highly satisfactory. Since the 1st of October, 1856, the following have been given at the expense of the Institution:—E. P. Hood, on "The Wonderful Transmigration of Words;" Ellis Roberts, "Entertainment on the Harp;" H. Phillips, "Origin and Decline of Sacred Music in England;" H. Blackburn (two), "Algeria—Its Manners, Customs, and Scenery;" Dr. Steggall, "The Chamber Music of England;" H. Hunt, "Application of Physical Sciences to the Useful Purposes of Life;" G. Grossmith, "David Copperfield;" Dr. Leask, "Life and Times of Mahomet;"

G. Grossmith, "Lectures on Lecturing;" H. Phillips, "The Songs of Dibdin;" Angus Fairbairn, "A Scottish Musical Entertainment;" Dr. Spicer, "Æsthetics;" G. Grossmith, "Nicholas Nickleby;" Mrs. Balfour, "Celebrated Women;" Dr. Spicer, "Architecture." Mr. H. Phillips gave his entertainment on March 26, free of charge to the funds of the Institution; as did also Dr. Spicer his lecture on "Architecture," on May 21st. Lectures have also been delivered gratuitously by the following gentlemen:—Rev. J. G. Hodgson, on "A few Common Things;" J. W. Flower, Esq., (Park Hill), "The Study of Natural History;" Col. Rowlandson, (Addiscombe) "The Chain of Brahminical Caste;" Rev. W. H. Johnstone (Chaplain at Addiscombe), "Nineveh;" Rev. W. Mitchell, "The Habits and Instincts of the Hive Bee." These lectures are thought to have done more real service to the Institution than any received from paid lecturers; the list of gratuitous lecturers will be still more extended during the ensuing year. That delivered by J. W. Flower, Esq., has been published at the request of the members, and has been a source of profit to the funds of the Institution. Nearly 300 volumes in the library have been re-bound, partly through the liberality of Mr. Westall, who gave 10 guineas for this purpose. The exchange of books has frequently averaged from 100 to 150 volumes every issue night. During the first quarter of the year, 1878 books were circulated among the members, and during the next quarter the circulation was very much larger. A printed catalogue is in course of preparation. Several donations of books have been made during the past year; 196 vols. have been also added by purchase, many of these being the works of recent and standard authors. The committee regret to report that the reading room has not been as yet made more available, and has not been more used of an evening by the majority of the members for whom it was more especially designed. The committee have not been able to establish evening classes for reading, writing, and arithmetic, as proposed. The difficulty of providing proper superintendence has at present prevented this project from being actually carried out. It is, however, earnestly hoped that evening classes for adults may be among the earliest works of the new committee in the ensuing year.

MEETINGS FOR THE ENSUING WEEK.

- Mon.** Royal Inst., 2. General Monthly Meeting.
Architects, 8. Mr. Edward M. Barry, "An Account of the New Palace at Westminster, and the progress of building the same."
- Tues.** Royal Inst., 3. Prof. Huxley, "On Animal Life."
Civil Engineers, 8. Mr. J. Henderson, Assoc. Inst., C.E., "On the Methods generally employed in Cornwall, in Dressing Tin and Copper Ores."
Pathological, 8.
Photographic, 8. Anniversary.
- Wed.** Society of Arts, 8. Mr. Robert Rawlinson, "On House Accommodation,—its Social Bearing, Individually and Nationally."
Geological, 8. Sir R. Murchison, "On the Succession of the Lower Palæozoic Rocks in the North-west Highlands of Scotland."
Pharmaceutical, 8.
Royal Soc. Lit., 8½.
- Thurs.** Royal Inst., 3. Prof. Tyndall, "On Heat."
Zoological, 3.
Royal Society Club, 6.
Antiquaries, 8.
Chemical, 8. I. Dr. Bird Herapath, "On the Iodo-sulphates of Cinchonine." II. Mr. Mercer, "On Atomic Weights."
Linnæan, 8. I. M. Fée, "On the Nomenclature of the genus *Buffonia*." II. Dr. F. Muler, "On the *Eucalypti* of Northern Australia."
Philological, 8.
Royal, 8½.
- Fri.** Archaeological Inst., 4.
Royal Inst., 8½. Dr. E. Lankester, "On the Drinking Waters of the Metropolis."
- Sat.** Adatic, 2.
Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTIONS ALLOWED.

[From Gazette, Jan. 22, 1858.]

Dated 19th December, 1857.

3117. Thomas Hart, junr., and Abel Jones, Blackburn—Improvements in looms called "dobby looms."
Dated 24th December, 1857.

3169. George William Hart, 3, Osborne-terrace, Southern—Improvements in the construction of locks, and in apparatus for cutting keys.

Dated 70th December, 1857.

3184. John Blake and Richard Ongdale Kay, Acersingum—An improved apparatus for reducing and regulating the quantity, force, or pressure of steam.

3192. John Clinton, 35, Percy-street, Whitehall—Improvements in the manufacture of wind musical instruments played by the mouth, and in mandrins used in such manufacture.

Dated 4th January, 1858.

10. Thomas Scott, Drummond-street, Boston-square—Improvements in cleaning, separating, and mixing seeds, and in apparatus for those purposes.

11. Edmund Thomas Wilm, St. Mary's Hospital, Paddington—Improvements in apparatus for ventilating buildings.

12. Frederick Walton, Haughton Dale Mill, Manchester—Improvements in the manufacture of sheets or plates made of plastic compositions and other materials, and in the application thereof, either alone or in combination with other substances, to the manufacture of knife handles, mouldings, artificial veneers, floor cloths, and other ornamental and useful purposes.

13. Edward Hamlin Kiddle, Broad-street, Lambeth—Improvements in snout machines.

Dated 5th January, 1858.

14. James Ellis and Joseph Henry Ellis, Leicester—Improvements in machinery for subdividing, or reducing into small particles, masses of rock and minerals.

15. John North Williams, Fwyg, Coventry, and William Adkins, Birmingham—Certain improvements in self-acting railway brakes.

16. James Leeming and John Carter Ransome, Bedford—Improvements in looms for weaving.

17. George Raymond Turing, Lockinge, Hartford—Improvements in electric telegraphs, and in the manufacture of insulated wire and cables.

Dated 6th January, 1858.

18. Thomas Miles Cooper, St. Albans—Improvements in the manufacture of wire applicable to umbrellas and parasols, and to other cases.

19. Richard Abraham Brown, 166, Fleet-street—An improved book buckle. (A communication.)

20. Henry Charles Troughton, 5, Great Tower-street—Improvements in the detection and application of tannin or tannic acid.

21. James Drysdale Macdonald, 47, Leicester-square—Improvements in apparatus for ornamenting fabrics and other surfaces.

Dated 7th January, 1858.

22. Samuel Leopold James Lavater, 25, Molywell-lane, Shoreditch—The application of the principle of exhausting air as used in plate presses, breast pumps for pigs.

23. Christopher Adrien Thiry, Paris—A new or improved oyster holder.

24. James Kelly, junr., Manchester—Improvements in chairs and several various descriptions.

25. Richard and John Philip, Norwood-house, Cheltenham—An improvement in propellers for propelling ships, boats, and other vessels in water.

26. Edwin Maw, Doncaster Iron Works, Cheshire—Improvements in the construction of metallic bolsters and other surfaces to be in contact with.

27. George John De Winton do Winton, Junior United Service Club, Charles-street, Saint James', Westminster—Improvements in copying apparatus. (A communication.)

Dated 24th January, 1858.

28. Louis F. Levy, Salted—Improvements in the manufacture of mineral oil.

29. Henry Beaumont, Bristol—Improvements in propelling ships or boats.

30. Peter James and John Campbell Evans, Morden Iron Works, Lancashire—Improvements in steam cranes, parts of which improvements are applicable to the generation of steam.

31. Richard Archibald Mackenzie, 165, Fleet-street—A method of teaching water teaching music and arithmetic. (A communication.)

32. Henry Ashlin, Nottingham—Producing scarfs, neck-ties, and other articles from the warp machine.

33. Thomas Greenwood and John Batley, Leeds—Improvements in machinery for backing flax and other fibrous materials.

Dated 10th January, 1858.

34. Robert Brown, Liverpool—Improvements in water-closets, parts of which are applicable to pumps.

35. William Church, Birmingham—Improvements in measuring rules, compasses, and in the machinery to be employed in manufacturing measuring rules and other mathematical instruments.

36. Thomas Rowell, Sunderland—Improvements in furnaces.

37. William Parsons and James Attree, Brighton—An improvement in the measuring of water and other liquids, and an improved water and liquid meter.

38. Jules Alphonse Mathieu Chaudet, Paris—Certain improvements in the construction of axle-boxes and axle bearings.

Dated 11th January, 1858.

39. Thomas Knowles, Hollingrove, Bury, and William Ogilvie, Manchester—Improvements in looms.

40. William Hartree, Lewisham-road—Improvements in furnaces or fire-places.

Dated 12th January, 1858.

41. André François Emile Robert, Paris—Improvements in the manufacture of curtains and hangings for walls and other places.

Dated 13th January, 1858.

42. George C. Greenwell, Radstock, near Bath—An improved pigment.

43. George Walker Muir, Manchester—Improvements in warming and ventilating.

44. Edward Brailford Bright, Liverpool—Improvements in communicating signals by electricity, and in the apparatus employed therein.

45. William Parsons, Pratt-street, Old Lambeth—Improvements in apparatus for supplying water to, and for preventing explosions of steam boilers.

46. Jean Baptiste Amédée Couder, Paris—Improvements in shawls.

INVENTIONS WITH COMPLETE SPECIFICATION FILD.

78. Marc Antoine François Mazzoni, 4, South-street, Finsbury—Certain improvements in gas records. (A communication.)
16th January, 1858.

WEEKLY LIST OF PATENTS SCALED.

January 2nd.	2045. Benjamin Richardson.
1744. Christopher Dierm Seroyen.	2041. Edwin Hallen.
2022. William Deakin and William Phillips.	2038. Edward William Barber.
2024. Charles Frédéric Vassero.	2039. Pierre Alexis Francine Bohmer.
2025. Edward Wilson.	2043. John De Laet.
2029. Joseph Needham.	2049. William George Finkett.
2033. John Scott Collins.	2078. Thomas Ivory.
2040. Ed. Archibald Brooman.	2079. James Alfred Lambert.
2046. Wm. Steffenius Clark.	2081. William Jewett Harris.
2048. Guillaume Félix Aroux.	2086. Edwin Maw.
2154. Wm. Alexander Clarke.	2113. William Calborne Cambridge.
2164. John Parkinson.	2116. Sebastian Bottani.
2394. Thomas Robson.	2117. Sebastian Bottani.
2432. Henry Beaumont.	2121. Sebastian Bottani.
2676. William Mac Naught and William Mac Naught.	2173. Hubert Fricke.
2682. Lucien Arbel.	2174. John Douglas.
2690. Henry Beaumont.	2269. Alfred Vincent Newton.
2832. Alexander Parkes.	2270. Alfred Vincent Newton.
2840. Alexander Parkes.	2843. Henry Crummett Bartlett.
2860. Emile Alcan.	2843. George Tomlinson Bonfield.
2890. Charles Wye Williams.	2904. Henry Davis Pughin and James Woolley.
2930. Walter McFarlane.	3023. Frederick Oakfield Ward.
January 24th.	
3000. William Blake Richardson.	

PATENTS ON WHICH THE STAMP DUTY OF £20 HAS BEEN PAID.

January 18th.	January 2nd.
170. William Kligour.	151. Charles William Tupper.
January 19th.	156. John Lammont.
167. Barnett Samuel.	227. David Moffat.
January 21st.	January 2nd.
182. John Livesey.	173. Frederic Fulmer.
	280. Joseph Lane.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No.	Date.	Title.	Proprietor's Name.	Address.
4014.	Jan. 14.	Improved Link or Fastener for Shirts, &c., and other articles of Wearing Apparel.	Edwin Page	Birmingham.
4015.	" 14.	The Improved Rapid Envelope for Needles.	W. Bartlett and Sons	Redditch.
4016.	" 14.	A Rub, Wash, and Pen-holder Combined.	George Frederick Morrell	149, Fleet-street.
4017.	" 14.	A Water-er Tray.	Wm. Tonks and Son	Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 5, 1858.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.

2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to the Society's House, Adelphi, London, W.C., carriage paid.

The days for receiving articles are, Thursday, the 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief but clear description of the invention, with a wood-block (when possible) for illustrating the Catalogue, and a reference to any publication in which the Invention is described.

All drawings exhibited must be framed.

ARTISTIC COPYRIGHT.

A Report as to the existing English Common and Statute Law, relating to this subject, has been prepared at the request of the Committee, by D. Robertson Blaine, Esq., Barrister-at-Law, Reporter to the Committee, and may be obtained of the Society's publishers, Messrs. Bell and Daldy, Fleet-street. Price Sixpence.

SPECIAL PRIZE.

A Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the Rev. F. Trench and J. Macgregor, Esq.,) and the Society's Silver Medal, is offered for a Writing-case suited for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following points, which will influence the Council in making their award:—

- Lightness,
- Smallness of size,
- The avoidance (if possible) of fluid ink,
- Durability,
- Cheapness, with a guaranteed supply, and
- General applicability to the duties, habits, and requirements of the above classes.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C. on or before the 8th May next.

EXAMINATION PRIZE FUND FOR 1858.

The following circular letter has been addressed to the Members of the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., Jan. 30, 1858.

SIR,—I am instructed by the Council to inform you that the Examination Prize Fund for 1858 is now opened. The donations for 1857 were contributed by twenty-three Members, and there is a small balance to carry forward.

The Council draw attention to the fact, that last year's Examinations were limited to two centres. At these two centres, pupils from thirty-seven Institutions only presented themselves; ten of them were from the metropolitan district, London being one centre; sixteen from Yorkshire, Huddersfield being the second centre, leaving but eleven for all England, Ireland, Scotland, and Wales. This unequal distribution was one of the reasons which satisfied the Council that the system was not adapted to meet the wants of all the Institutions. They, therefore, resolved to bring the Examinations to the very doors of the Institutions, by such step of course throwing open the prize fund to the students of every Institution.

The Council have also decided on contributing a certain mileage towards the travelling expenses of those candidates who desire to receive personally and publicly their prizes, and also £5 towards the travelling expenses of each pupil, who, obtaining three of the Society's certificates of the first class in the subjects contained in the Oxford programme, is desirous to contend for the degree of Associate at the Oxford Examinations. These changes lead the Council to believe that a considerably larger sum than last year will be required for the prizes, and I am, therefore, instructed to draw the attention of all the members to the circumstances.

Donations can be remitted to Mr. Samuel Thomas Davenport, Financial Officer, Society of Arts, Adelphi, London, to whom Post-office Orders should be made payable.

I am, Sir, your obedient servant,
P. LE NEVE FOSTER, Secretary.

The following is the list of Donations up to the present date:—

T. D. Acland	£ 5 5
J. G. Appold	10 10
Harry Chester	10 10
C. Wentworth Dilke	10 10
Lord Ebury	5 0
J. G. Frith	5 5
F. Seymour Haden (annual)	2 2
Edward Highton (annual)	2 2
The Marquis of Lansdowne	20 0
Sir Thos. Phillips	5 5
Arthur Trevelyan.....	1 0
T. Twining, jun.....	10 10
Dr. J. Forbes Watson.....	1 1
G. F. Wilson, F.R.S.	10 10

FIBRES FROM CEYLON.

Samples of Fibre from Ceylon have been received by the Society, through Messrs. Frith, Sands, and Co., and the following is the broker's report thereon:—

Nos. 1 and 2. Pine-apple Fibre, good colour and fine fibre, rather short; if available for spinning on flax machinery, which it apparently is, it would be worth £55 or £60 per ton.

No. 3. A longer, softer fibre, but not of such colour. Value about £55 per ton.

No. 4. Plantain Fibre, of fair colour and length, suitable for mixing with Manilla Hemp. Value, £28 or £30 per ton.

No. 5. Coir Fibre, clean, even, of good colour, and strong; if a parcel were landed as good as this sample it would realize £35 per ton.

The samples may be seen at the Society's house.

THE BOMBYX CYNTHIA.

The following communication has been received from the Colonial Office:—

Downing-street, 29th January, 1858.

SIR,—I am directed by Mr. Secretary Labouchere to request that you will lay before the Council of the Society of Arts a copy of a despatch from the Governor of Malta on the subject of the *Bombyx Cynthia* silkworm.

I am, Sir, your obedient servant,
HERMAN MERIVALE.

The Secretary to the Society of Arts.

(DESPATCH REFERRED TO.)

Palace, Valetta, December 22, 1857.

SIR,—In 1854, I made several reports on the *Bombyx Cynthia* silkworm, which feeds on the castor-oil plant, for the information of the Society of Arts. It had been introduced into Malta from India in that year, and appeared both hardy and wonderfully prolific, yet it failed in Malta in 1855.

2. I had, however, previously distributed a great number of eggs, by sending them to Italy, France, and Algeria; and I continued to watch the accounts of the trials made in those countries. I found that it had spread there, and had been carried to Spain and Portugal, and was creating considerable interest wherever it had been tried.

3. I was therefore induced to re-introduce it into Malta. At the end of July last, I received a few eggs by post in a quill from Paris, and these have multiplied in an extraordinary manner, so that I have not attempted to have them counted. The temperature of the winter season, now in December, seems, however, to be affecting them even in Malta, inasmuch as they grow more slowly than they do in summer, but, nevertheless they appear healthy.

4. A very interesting paper on the progress making in different countries in rearing the *Bombyx Cynthia* will be found in the last number of the papers of the French Société d'Acclimation. This paper is by the able President of that Society, M. Geoffroy Saint Hilaire.

5. I had, in 1854, successfully sent the insect to the West Indies. The French Society have sent it to Brazil, to the Southern United States, and into Egypt. It is being introduced into Germany, and we are now sending more eggs and worms from Malta to Sicily.

6. Experiments are making in France on spinning the silk, which is found to be very fine, very strong, and to take dyes well. In France, the cocoons are carded and afterwards spun, as in Malta. It is said that the chrysalis, on extricating itself from the cocoon and becoming a moth, does not, as was supposed, cut the thread; and the French have partially succeeded in unwinding the cocoons.

7. The great interest I find taken in other countries in the attempts making to naturalise the *Bombyx Cynthia*, has induced me to report to you its re-introduction into Malta, with the view of begging you to make this known to the Society of Arts. I enclose an extract from my despatch, dated 7th July, 1855, which explains the manner in which I successfully sent the insect to the West Indies, and in the same manner it may be easily conveyed from any one country to another. It may be found difficult to preserve this silkworm throughout the

winter season, as well as difficult to grow the *Eucasia*, its proper food, in the climate of Europe. The proper climate for the *Bombyx Cynthia* is within or on the borders of the tropics. But the attempts now making ought not to be the less encouraged on that account, for they are producing a new raw material for thread and clothing within reach of men of skill and science, and 127,000 cocoons have recently been sent from Algeria to be manufactured in Alsace.

8. The extraordinary manner in which the *Bombyx Cynthia* multiply, together with the abundance of food for them, produced without culture in warm climates, renders the study of the habits of this insect and the nature of its cocoons of considerable importance.

9. I send herewith a small sample* of the cloth made from worms reared in Malta.

I have the honour to be, Sir,

Your most obedient humble servant,
WILLIAM REID, Governor.

Extract of a Despatch from the Governor of Malta to the Secretary of State. No. 83, dated 7th July, 1855.

6. It may be useful to state how the *Bombyx Cynthia* was successfully transported from Malta to the West Indies, after many attempts to bring it from India to Europe had failed.

7. Having first obtained the authority of the directors of the Peninsular and Oriental, and of the West India Royal Mail Steam Packet Companies, about 30 fresh cocoons were placed in bird cages, and suspended in the cabin of the surgeon of the steam ships. This was done that males and females might be kept together when the chrysalides became moths. In the moth state they required no food. On the voyage they laid their eggs, and these eggs began to hatch on their arrival at the Island of Grenada in the West Indies.

NINTH ORDINARY MEETING.

WEDNESDAY, FEB. 3, 1858.

The Ninth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 3rd inst., the Right Honourable the Earl of Shaftesbury in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Everett, Frederick William	Rock, Thomas Dennis
Gray, Capt. William, M.P.	Williams, Alexander
Herapath, Spencer	Woods, Nicholas
Laxton, Henry	

The Paper read was:—

ON HOUSE ACCOMMODATION—ITS SOCIAL BEARING, INDIVIDUALLY AND NATIONALLY.

By ROBERT RAWLINSON, CIVIL ENGINEER.

The paper now brought before the Society, is intended to direct attention to houses as they have been, to houses as they are, and to houses as they ought to be. The house accommodation of the masses will be principally considered, some of its defects will be pointed out, and of the resultant evils will be described, and certain suggestions for means of improvement and of sanitary regulations will be made. The question of house accommodation is far too comprehensive to admit of its discussion in the time allotted to one evening; and therefore, disappointment may be felt that some particular branch of the subject has not been dwelt upon.

* This sample has been received, and may be seen at the Society's house.

House accommodation and house construction have received the attention of His Royal Highness the Prince Consort, and also the attention of many noblemen, gentlemen, and ladies, who have followed the good example set them. "Model houses" and "improved cottages" have been erected by societies and by individuals, with beneficial results most encouraging. To remedy all existing defects in houses of the poor in such manner, is, however, too much for isolated individual enterprise, and far too vast even for a free government. How, then, must the work be done? I will not attempt to give a full answer, but will content myself with pointing out some of the existing evils, and with shewing how widespread these evils have been, and now are, and then briefly indicate a few practical remedies. Improvement must, I consider, consist in inspection, and in regulation, by the local authorities, wherever neglect, filth, and disease exist.

Particular plans of improved cottages will neither be described nor recommended, not because their appropriateness and advantages are not recognised and appreciated, but simply because there is not time to discuss the whole subject. I may be asked, "Why, then, open up the question?" My answer is, that in this great and free Christian country, knowledge must precede beneficial change, and to inculcate the necessary knowledge there must be "line upon line, precept upon precept." Many good and able men have spoken and have written upon "the habitations of the poor," and many more good men must speak, must write, and must act, before the work will be even hopefully initiated. The question is one of health, of morals, of religion, and essentially one of national safety. If, as a nation, we will not work from higher and more Christian motives, our selfish fears may, in time, prevail. The health and life of a nation are in the masses.

A celebrated writer has said, if he might "write the songs of a people, he cared not who wrote their laws." I would say, "if I might house the people I care not who writes songs, or who enacts laws." Good citizenship is not from without, but from within. If men and women learn immorality from their birth, and in their homes are surrounded with vice as with the atmosphere, of what practical use can any secondary means prove? National schools, national reformatories—private schools and private reformatories—must alike fail. Gaols do not improve the morals of criminals, but notoriously render them worse. Gaols are actually looked upon by many criminals with favour, and not with dread. Cottages are not so clean, nor so airy, nor so warm, nor so healthy, nor so comfortable as prison-cells. I do not say "neglect the gaols," but I do say "look to the cottages, to the birthplaces, the homes, the true schools, and the only practical reformatories for the poor."

HISTORIC SKETCH OF HOUSES.

The earliest form of protection for the human body from the effects of climate, would most probably be a "gourbrie" or a tent. Caves would only be resorted to after crime had induced personal fear, and rendered seclusion necessary to personal security. The tent of the Arab is, to this day, as were the tents of the patriarchs. Types of house-construction may probably be found, in use, in one part of the inhabited globe or another, which faithfully represent every contrivance for shelter either invented or appropriated by man, from the burrow of the bushman to the "solemn temples" and "gorgeous palaces."

Invention and progress seem to be confined to a few of the many races of men, and progress, with permanence, has, so far as we know, as yet been the lot of none. The much-vaunted Anglo-Saxon race is only on its trial—and, if Lord Macaulay's prophecy should come true, we know its fate. Look abroad over the wide and fruitful regions of the earth, and we shall find retrogression in vast masses of the population, or super-

stitious forms stereotyped. As the Chinese were in ages past, so are they now. Throughout the East, generally, we find desolation or barbarism where civilisation once reigned.

In these regions, from the earliest periods of history, and under every form of government, we find that the masses of the people have been badly housed, and hence have occurred plagues, pestilences, misery, and premature deaths. The history of man, with few exceptions (the Jews, Egyptians, Romans, &c.), down to the present time, is indeed one of neglect of sanitary laws, and consequently of retributive punishment. The Registrar-General points out weekly, quarterly, and annually, the national mortality, indicating the preventible excess, but, so far, to little practical parochial or municipal purpose, as compared with the work required to be done. Ignorance is fenced round with selfishness; the desire is to protect property and pocket; the results are ruin to property, and to health, and morals; the sacred name of freedom is invoked to perpetuate a state of things which breeds vice and engenders crime. An Englishman's house is said to be his castle. When Englishmen learn to keep their castles (that is, houses) so as not to destroy their own health, and render themselves, their wives, and their families a burden to the community, they may be left alone; but a man cannot be allowed to keep at large a savage dog, or a mad bull, to worry, to tear, and to gore the public. Why, then, should any man be allowed to generate and let loose typhus, small-pox, and other analogous diseases, to disfigure and to destroy? Lord Shaftesbury, by his Common Lodging Houses Act, has given the means to prevent disease, and to diminish immorality, wherever the Act is put in force, and the beneficial results are acknowledged alike by landlord and by tenant. Let there be such power of inspection, wherever contagious diseases break out, whether the house be that of a rich man or that of a poor man, and the results will be a benefit to all. Several towns have had public and private works of sewerage and drainage carried out with most marked beneficial results. But back streets, courts, and alleys remain neglected, room tenements and cottages (not common lodging-houses) remain overcrowded, unventilated, filthy, and breeders of fever. The parish authorities can only relieve distress brought about by preventible disease; they cannot, or they do not, remove the causes of the disease.

HOUSES AS THEY HAVE BEEN AND HOUSES AS THEY ARE.

Central Asia—the birth-place of truth and of myth—the cradle of history—the land of contrasts—presents us with the oldest type of human dwelling; and what do we find but, side by side, the most wretched hovels and the most luxurious palaces? In the hovels we find the Arab-Egyptian (the Fellah), the "Ryot" of Hindostan, and the swarming masses of China, who all fare badly. A hut of mud, a roof of thatch, a floor of filth, hovel and clothing abounding with parasitical vermin, where skin diseases, ophthalmia, along with other analogous complaints prevail. From generation to generation there has been, and there continues to be, the greatest amount of misery to the greatest numbers. The tropical sun shines down upon filth, upon squalor, and upon disease. The vulture, the stork, the dog, and the hog scavenge the streets and suburbs as of old; and at a glance you may see that the existing dog of an Eastern city is a lineal descendant of those dogs which licked the blood of Ahab, and ate the carcase of Jezebel beneath the wall of Jezreel. Plague ever broods over these sites, and cholera sows its subtle but death-producing seeds in the face of the sun, to be wafted wide as the atmosphere, to kill wherever there is degraded man, living amidst filth, foul-air, and wallowing in sin.

The Russian serf is miserably lodged; the habitations are of rude materials, are primitive in form, and wretched in accommodation. Over the continent of Europe, generally, the poor are lodged in mere hovels, with de-

human beings. In gaol each criminal has, at the least, one thousand cubic feet of fresh air secured, and the air in this space is regularly, evenly, and many times changed during each day. The inhabitants of room tenements, of country cottages, of Scotch boothies, and of similar places, have frequently not one hundred cubic feet of air space, and this air is never changed, but by the natural law of diffusion of gases, the deleterious carbonic and sulphuric acids are allowed to perform their fatal work.

There are many defects in old and in modern villa and suburban houses, such as improper site for detached houses, in the country or in the suburbs of towns. The site may be a swamp, an undrained hill side, or even a hill top. The sewerage and drainage may be defective; the plan may be confused; the rooms may be too low; the doors, the windows, and the fire places may be improperly placed; and means for ventilation may have been entirely neglected. The pump and the cesspool may communicate, and pipes, and gutters, and cisterns of lead, may add that deleterious metal, in solution, to the water used for domestic consumption. There are few country or suburban houses, even of the better class, entirely free from some one or more of these defects, no not even the mansions and palaces.

Having glanced at houses as they are in courts, in lanes, in alleys, and in the back slums of towns, and at some of the defects of those in their suburbs, we will now look at some houses as they are in the country throughout Great Britain.

COTTAGES.

Look at these structures called cottages. They are mere hovels of mud; or of "wattle and daub;" or of rubble stone set in mud; or of rude timber frames filled in with mud, or with brick, or with stone, or with other material. The timber is rotten; the mud, bricks, and stones, are damp in wet weather, and dusty in dry weather. Look at the site; probably a hole; not unfrequently a swamp several feet below the adjoining road, the slope being towards the door. If on an elevation, the ground is unformed, rugged, abrupt, uneven, and neglected. Many of these hovels are only one story in height, the side walls are very low—from three to six feet up to the equare—few are vertical and some are supported by buttresses or by props. Many are half-buried against a hill side, or against a bank which is wet.

Then the roof. This is thatch of heather or of straw; or is formed of turf, of sods, or of shingle, of tile or of slate. If of thatch, the material is rotten with age, and green with fungoid vegetation; if of shingle, the timber is decayed; if of slates or tiles, they are broken and in holes. Doors and windows match the structures, and the floor is native mud, the space enclosed being common to bipeds and to quadrupeds alike. The floor is not only very dirty, but the walls, roof, and furniture are the colour of grimy dirt. Amongst the rafters, spiders and other insects abound. Outside, animal refuse is stored in some hollow where liquid permanently rests, so as to keep up evaporation and an evolution of gases, highly injurious to human life, and if this refuse does not actually surround the hovel, it is frequently so situated that the prevailing winds shall drive the gases of decomposition into and through the habitation. The arrangements for disease, misery, and premature death are ample, adequate, and complete. The hovel is crowded by males and by females of all ages, without means of separation, so that the arrangements for sin and misery are also complete. Morality is consequently at a low ebb. How can it be otherwise? Look at the country in which these hovels are situated. There may be the grand old mountains of Wales, fragrant with heather and wild flowers; there may be the glorious lake scenery of Cumberland; or there may be the graceful undulations of the midland counties, agriculturally rich beyond the romance of fable,—trees, corn-land, and grass-land blending harmoniously; or we look over the wolds of the chalk and

oolitic district, open in broad rounds and valleys, dry and comparatively bare of trees, but, nevertheless, yielding rich herbage and fine crops. Such hovels as I have faintly attempted to depict may be found in landscapes such as I have most imperfectly attempted to describe, but the houses are neither ornamental nor useful, although artists persist in designating them picturesque. There are not only agricultural hovels, but there are sea-side fishermen's hovels, and out-of-the-way miners' hovels. They are, however, all of one type, and are too frequently nests of filth, of foul air, of sickness, of immorality, of human degradation, and of human sorrow. The parish doctor knows the inhabitants; they consume his time and his physic. The relieving officer knows them—they empty the public pocket. The parish constable knows them—they are his most turbulent customers. The gamekeeper knows them, as frequently they are poachers. The magistrates know them—they commit petty thefts, and produce bastardy cases innumerable. The minister of religion knows them, as most assuredly amongst these people his principal work lies. The charitable know them—ladies, beautiful, delicate, and good, visit, sympathise, and relieve.

"Hovels, and their inhabitants, as they are," such as I have tried to describe them, are known and they are unknown. They are known to artists, to parish surgeons, to constables, to gamekeepers, to some clergymen, and to benevolent ladies, but they are, for the most part, unknown to parish guardians, to town-councillors, to country squires, to imperial legislators, to the general public, and to very many landowners. By some landowners their existence is considered to be an incumbrance. Cattle have value for such persons, but not human beings.

SCOTCH HIGHLAND AND ISLAND BOOTHIES.

The cottage, boothie, or hut in Scotland is a barbarous shelter. Many of those in the highlands and islands are mere hovels, rough in the materials used, and rude in the form of construction. The side walls and gables are of dry rubble stone, peat, or mud; the covering is thatch, mud, or sod, often a jumble of material, plastered, piled, weighted, or tied on. The door is low; a mere hole serves for window; and a hole in the roof lets out a portion of the peat fire smoke. There is no flue, and, consequently, when the fire smokes, there is a general distribution of smoke with the heat, so that a philosopher may study the law of "diffusion of gases" visibly. Smoke not only rises through the hole specially left for its escape, but pours out of door, window, and also out of every crack and cranny in roof, and side wall. A stranger might easily imagine that the boothie was on fire, or mistake it for some charcoal burning apparatus or kiln. The inside of one of these boothies is a curiosity. There is an attempt at division, and beds are made up in recesses of the smallest dimensions against the damp walls or bank, and closed in by the aid of peat, hurdles made of heather, or some equally rude contrivance. If there are ceiling joists, a loft is made in the roof, to be reached, not by stairs, but by a ladder, and this may be a general store or a bed-room. Most frequently the natural earth—be it rock, mud, or peat, forms the floor, full of holes, worn and uneven. Pavements may be found of rude flags or pebbles, or a mixture of both. Many boothies give shelter to cattle and other animals which man retains for his use—quadrupeds and bipeds—such as dogs, pigs, ponies, ducks, fowls, &c. They may enter all by one door, or there may be a separate entrance under one roof. Inside and outside these places there is dirt and neglect. The very spirit of thrift could not, in fact, keep such places clean. Smoke is as the breath of life to the residents, damp and dirt an institution.*

* Up to the early part of Elizabeth's reign, cottages in England generally consisted of a single room, and chimneys were unknown in such dwellings. Up to the end of the 13th century,

There is a great deal of talk about the necessity of ventilation in houses, and a great deal of money has been expended in the construction of houses with elaborate ventilation systems.

But the question is, what is the nature of the evil which it is necessary to remedy? Is it the want of fresh air? Is it the want of light? Is it the want of warmth? Or is it the want of some other thing?

It is a question which has been discussed by many writers, and many experiments have been made. But the result is, that the evil is not what is generally supposed to be. It is not the want of fresh air, nor the want of light, nor the want of warmth. It is the want of some other thing, which is not generally understood.

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VENTILATION OF HOUSES.

Many writers have been published on the subject of ventilation, and many patents have been granted for apparatuses to effect ventilation; and yet, one of the evils which attend the use of a gas-stove in private buildings, is the want of ventilation. How is this? The nature and properties of the atmosphere have been accurately described, and the means of ventilation have been fully explained by more than one author, — from James Watt to Dr. Arnet; but, somehow or other, the right knowledge does not get into the right

mans dwellings, were literally fortified places, in which the ventilation was considered for purposes we did not till the 15th century that houses were the gloom of their castles for the comparison and convenience of castellated houses.

men. — some of the highest of thinking, all the men of the world, and the most successful and successful. With the want of ventilation there is a vast amount of the evil of the atmosphere, and of the want of ventilation. It is a question which has been discussed by many writers, and many experiments have been made. But the result is, that the evil is not what is generally supposed to be. It is not the want of fresh air, nor the want of light, nor the want of warmth. It is the want of some other thing, which is not generally understood.

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place. Who does not suffer from cold feet in winter, especially during frosty weather?

Small rooms, having less air to pull upon expansively, frequently smoke by puffing down-drafts in the chimney. The fire forces air up the flue, until the air is too highly rarified, and there is practically a partial vacuum; cold air then descends the flue to restore the balance, forcing some of the heated air and smoke with it. Large rooms, as a rule, are more easily warmed, and are freer from draughts than small rooms.

There is one form of evil connected with houses, namely, the admission of foul gases from sewers, drains, or cesspools, which, being unseen, may remain unrecognised, although much sickness and many premature deaths may occur in consequence. At all times when the internal temperature of any house is higher than the external air, there is an active exhaustion caused by the fires up the chimney, and there is a drawing or pumping power within the house, and sewer and cesspool gases are drawn in from every crack and from every cranny. The mischief of such a state of things is very great. In forming sewers and drains, this contingency should never be lost sight of. Defective sewer and drain connections are a source of mischief both winter and summer, as in winter the foul gases are drawn in, and in summer sewer gases (sulphuretted hydrogen) and others, which are lighter than common air, flow in. Many persons think that houses situate on a hill, or having a rapid fall for the drains and sewers, must necessarily be easily drained, this is a mistake; there must be special and ample provisions for external ventilation from the sewers and drains, or the gases from lower levels will flow up and into such houses. Water, by reason of its weight, which is greater than atmospheric air, flows down hill with velocity proportionate to the slope and to the friction; sewer-gases, by reason of their gravity, which is less than atmospheric air, flow up-hill with velocity also proportionate to the slope and to the friction. It is of the utmost importance that these facts should be remembered.

There is the law of "diffusion of gases," by which gases diffuse throughout other gases and throughout atmospheric air. If this law were annihilated, the present order of animal creation must cease to exist. It is the diffusion of gases which renders a hut, boothie, cabin, room, common lodging-house, or modern drawing room, tolerable during excessive crowding. The poor over-crowd their wretched apartments partly from ignorance, but more from stern necessity. The wealthy crowd a modern drawing-room partly from ignorance, but more because it is fashionable. The mischief is alike fatal in both cases. At a dinner table we have our plates and knives and forks changed, and use separate glasses for purposes of drinking, but in a crowded drawing-room, and in a crowded ball-room, we breathe and re-breathe the waste products of our own and of each other's lungs, vitiating and re-using the air in common, a process far more injurious to health than using plates and glasses in common. Ventilation, free and abundant, should, in all cases, be provided for. But no amount of ventilation will do away with the evils of overcrowding. An overcrowded hovel, or an overcrowded drawing-room, is only an evil in a lesser degree, if even their ceilings and their roofs could be removed.

The following extracts from Reports by the Inspectors of the General Board of Health will give some idea of the sanitary condition of the dwellings of the poor in the towns named.

The supplement to the report on Whitehaven, dated 1849, contains tables of the "room-tenements" and "cellar-tenements" within the district, and states that "the buildings are in a ruinous condition; the staircases are of wood, frequently dark, confined, and rotten or out of repair. Where the beds are described as 'old and dirty,' they are upon bed-stocks, but very few of them have anything to cover them with but a bundle of old

raggs. Those beds, named 'raggs and straw,' are on the floor without bed-stocks, and without proper bedding to cover them with; the bed-clothing, if any, a bundle of raggs. Many of the rooms are swarming with vermin; disease and fever prevail throughout."

Out of 315 room-tenements, inhabited by 1,369 persons, there are 256 described as being without means of ventilation. The beds in 83 of these tenements are composed of "raggs and straw," and nearly the whole of those in the remaining tenements come under the headings of "dirty," or "old and dirty."

Out of 191 cellar tenements, occupied by 716 persons, not less than 177 are stated to have no means of ventilation. "They are damp and dirty to a degree not to be described; a heap of dirty straw or rubbish constitutes the only form of bed in most cases, and this is laid on the damp floor in one corner. The confined smell and fetid atmosphere are most offensive, and almost suffocating to any person entering. They have no privies, or convenience for ashes, but the inhabitants get rid of their refuse as they best can, most frequently immediately in front of their door." It may be added that 12,000 of the inhabitants, or two-thirds of the entire population, were, at the date of the report, without any privy accommodation.

In the report on Gateshead, speaking of the dwellings of the poor, the Inspector says,—

"Neither plan nor written description can adequately convey to the mind the true state and condition of the room-tenements, and of the inhabitants occupying them. The subsoil on the sloping side of the hill is damp, and most foul; the brickwork of the buildings is ruinous, the timber rotten, and an appearance of general decay pervades the whole district. The buildings, originally erected as residences of a superior description, have single rooms let off as tenements, which are crowded with men, women, and children; the walls are discoloured with age, damp, and rot; the windows are broken—old raggs, straw, and boards, occupy the place of glass, so that means of light and ventilation are alike absent. There are no sewers nor drains, neither is there any proper (privy) accommodation; solid filth encumbers the surface; liquid refuse saturates the subsoil, and is drawn by capillary attraction through the porous bricks up into the walls; personal cleanliness or a healthy atmosphere is impossible."

In the Report on Dover, the following evidence of the relieving officer of the district is given:—

"The largest proportion of out-relief distributed in the worst portions of the district is caused by fever, small-pox, and other similar complaints, such being very prevalent in these localities; caused, I have no doubt, to a very great extent, by the closeness of the buildings, and their filthy state, from want of proper drains and other sanitary regulations."

"From the experience of upwards of ten years' intimate connexion with the poorer classes, I have not the slightest hesitation in affirming that there is a most decided direct connexion betwixt confined districts, bad sanitary arrangements, and poverty and vice. In the worst districts the moral state of the inhabitants is most deplorable,—as the youth from these places grow to manhood they become habitual thieves or paupers; brought up to no regular employment, grossly ignorant and reckless, their time is spent between the gaol and the union workhouse." I can only say that if the Government wish to prevent the increase of a most debased and vicious population, they will take measures, if not to sweep away these nests of vice and disease already built, at any rate to prevent similar places from being erected in future."

The Rev. T. W. Darwell, curate of St. James's parish, Dover, says—

"My own observations and experience in visiting among the poor, tend most decidedly to confirm the evidence that better sanitary regulations would tend very materially to improve the habits of the per-

ly to live, sleep, cook, eat, wash, &c., in a single room; the corners of single rooms thus occupied, being usually further sub-let to other families or lodgers." In regard to privy accommodation, the commissioners state that Gateshead is as deficient as Newcastle, whilst at this point it is even more deficient, viz., in not having a public privy.

In reference to the cost of the epidemic in Gateshead the commissioners say "That an expense of about £1000 was incurred by the Board of Guardians for immediate services; that a public subscription of about £1000 was similarly expended; that an annual expense of about £450 was incurred for the maintenance of persons thereby rendered chargeable to the poor rates, which at only six years' purchase, would amount to £2700; so that, without considering the loss arising from stoppage of trade, &c., the cost of the outbreak amounted to some £4,600."

CONCLUSIONS.

A study of house accommodation, especially for the poor, not only of this country but of all countries, has led me to the following conclusions:—

1st, as a rule, men so construct their habitations as to vitiate the common atmospheric air, rendering the length of life a fruitless source of disease.

2nd, placing houses on improper sites.

3rd, leaving those sites uninformed, undrained, unpaved, and uncleaned.

4th, using improper materials for houses, and by adopting unsuitable plans.

5th, totally neglecting adequate means to secure ventilation.

6th, overcrowding, by indiscriminately mixing the sexes, and by allowing the adoption of habits of filth.

7th, the results in all ages have been fevers, plague, &c., the analogous diseases which destroy infant life, which cut off mature adults.

8th, that there may be portions of the earth's surface unfitted for the use of man, but that, as a rule, the sources of disease are not so much in countries, in climates, in elevation, in density of population, or in any external cause, as within the walls and beneath the floors of the houses and tenements. Masses of people, contrary to the simple laws of nature are necessary to decimating epidemics, and not peculiar climates, geological formations, great rivers, river deltas, inland seas, or mountains.

9th, that fresh air is the first requisite to health, and that houses which do not admit of fresh air being admitted by the inmates—waking and sleeping—are defective in construction, are also defective in arrangement, and probably most defective in personal management.

10th, that the poor of this country cannot provide themselves with houses suitable to health, but must inhabit such as are placed at their service.

11th, that many of the poor, and many working men, cannot pay a sufficient rent for healthy cottages or houses, if they had a choice betwixt good and bad cottages and rooms, or could obtain healthy places of residence.

12th, that, in many instances, the losses caused by defective house accommodation are either direct, or indirect, charges upon parishes. Foul air induces fever; fever destroys adult life, and then widows and orphan children become a parish charge.

REMEDIAL MEASURES PROPOSED.

1st, That in parishes, corporations, or in separate districts, there shall be an Inspector of Nuisances appointed; but that several small or poor places may be combined under one Inspector, with the sanction of the General Board of Health.

2nd, That upon an outbreak of contagious fever, small pox, or other zymotic disease, the parish doctor, local medical officer, or local inspector of nuisances, shall have power

to inspect the premises, and report to the local authorities.

3rd, That there shall be local power to insist on proper means of ventilation to all cottages and room tenements; and that lime-washing may be ordered, or may be executed by the parish authorities, the cost to be recovered from the landlord.

4th, That subsoil and surface draining may be ordered, or may be executed where required.

5th, That every room appropriated for human habitation shall have, at the least, one door and one window, capable of admitting sufficient light, and that such window shall be so constructed as to open so as to allow of full ventilation.

6th, That there shall be sufficient "privy" accommodation to all houses and tenements, of not less than one seat to each ten persons.

7th, That there shall be means of external ventilation and sun light to all dwelling-houses.

8th, That there shall be means for a separation of the sexes in all houses and in all room-tenements.

9th, An improvement in the law so as to facilitate the sale of land for house building purposes, would afford means for improvement.

10th, In new buildings, rooms to be inhabited should not be less in height from floor to ceiling than nine feet vertical.

11th, All houses should have the roof eaves spouted; and all yards, courts, and passages in the immediate vicinity of houses should be paved, or flagged, and surface-channelled.

I have briefly and imperfectly treated a most important subject, and must now leave the question of improved house accommodation to the consideration of our legislators and thinking men. The problem of house accommodation deserves to be worked out. If defective houses were only inhabited by the poor, remedial measures would be imperative on Christians; but the case is more hopeful. Very many families earning good wages (from £1 to £2 per week) can obtain nothing better in which to live than a wretched hovel, a cottage in a blind alley, or a house up a narrow and dark court, or some miserable rooms or single-room tenement. The prices charged and paid vary from 2s. 6d. to 5s. 6d. per week; in the one case, £6 10s., and in the other, £14 6s. per annum. It is practicable to build cottages in the country and in small towns, having four rooms, for a rent of £6 10s. per annum, and blocks of houses in towns and cities, of equal accommodation, for a rent of £10 per annum, the common rate of interest being received in the form of rent; such houses to be properly sewered and drained, to have wash-house and drying-ground—in common to, say, ten such tenements,—to have a full supply of good water, to have "privy" accommodation adequate to privacy and decency, and to have means for ventilation and light to each room. In the country, garden allotments are a comfort, a source of profit to landlord and to tenant alike, and a great blessing to the provider and the user. Ornamental cottages, if the ornament is costly, are not required. Improved dwellings and cottage allotments should not be made into show-places. An honest poor man does not require petting, but opportunity to be a good Christian, and to live by labour. He is sure, under such conditions, to be a good citizen.

Human society, to be stable, must be like the pyramid; the foundation must be broad, and it must be secure. The mystic priests of Egypt expressed their ideas in symbols, and I am not sure the pyramid was not intended to symbolise the construction of a nation. The broad, spreading base—the people; the diminishing, but rising courses—the middle classes; the upper courses—the nobility; crowned by the kingly apex—forming the only practicable finish to a symmetrical, secure, and enduring structure. The idea may be a vain fancy; but if Great Britain is to endure—if our civilisation is to progress—if our religion is to bear appropriate fruit—if the great social evil is to be grappled with and subdued—the base

alive to the importance of the subject. He therefore thought that their time would have been more profitably occupied in discussing the practical details of the question than in the laying down of principles to which he thought there could not but be universal assent.

Mr. THOS. SCOTT was so strongly impressed with the belief that the right course had been taken by Mr. Rawlinson in treating this important subject, that he could not agree with the remarks of the last speaker with regard to the discussion of the practical details. They all knew that the President of the Society had set the good example of building model cottages for labourers, and yet they had been condemned by many architects. At the same time His Royal Highness had done much good by enunciating the principle that better dwellings for the poor were required. In like manner Mr. Rawlinson had shown the necessity of cultivating a proper sense of the importance of this subject amongst those who have the means of providing better accommodation in the dwellings of the working classes. It was not always the case that the appearance of sanitary commissioners in a town tended to increase the value of property. He had known instances in which property had been greatly depreciated by that means, though he was ready to admit that in large towns the necessity of municipal or parochial interference in these matters was often evident. Mr. Scott proceeded to argue in favour of the promulgation of correct views in these matters, and of thus stimulating a desire for improvement amongst the people themselves. He instanced cases in Ireland and Scotland, illustrating the difficulty there was in overcoming long-rooted prejudices in favour of the cabin and the hut. It required the promulgation of principles to dispel those prejudices, and to raise the taste of a people to a true appreciation of the improvements which were designed for their benefit.

Mr. T. D. ACLAND regarded this subject as one of the greatest importance, and he believed he was not singular in that view. No doubt, amongst landlords there were to be found many selfish men, and the more they were denounced the better; although, perhaps, after all, that was not the best way of improving them. This subject had engaged the public mind for a great many years, and he was happy to say there were many good men earnest in the cause, but what they wanted to know was how to adapt the necessary improvements to the houses of the poorer classes, without being charged 20 per cent. more by the builder for carrying them into execution. He had lately been building on his own account, and though he had given most positive instructions that the best known method of ventilation should be adopted, the builder had stated that he was unable to find any really practical system which he could adopt. It was known to many present, that the late Mr. Pusey, who was connected with the Royal Agricultural Society, had for sixteen years been constantly occupied with the subject of improving the dwellings of the labouring classes, and year after year had offered prizes for improved designs for cottages. It was universally admitted that good cottages should be provided for the people. They were told by the highest authority that if the poor man needed a cloak they should give it him; but he thought the practical question was the discovery of such means as would enable builders to construct such houses as should, at the current rate of wages for labour, enable the occupier to pay a remunerative rent to the builder for his outlay. He was equally surprised and gratified at hearing a few days since from Mr. Robert Smith, well-known in the agricultural world, that he had erected, in the district of Exmoor, six cottages, with three bed-rooms and a fire place upstairs, at a cost of only £60 apiece. That was a fact of great importance, and he hoped ere long Mr. Smith would give the world the benefit of his experience in this matter. For his own part he had always found difficulty in erecting cottages for £100 each. He hoped that Mr. Rawlin-

son, who was so well-qualified for the task, would, on a future occasion, point out some practical means by which this desirable object could be attained, namely, the erection of good and wholesome houses for the poor at a moderate cost.

Dr. WYLD advocated the plan of making iron bedsteads fixtures in a house, in the same way as was now done with fire grates. He thought if in one particular the poorer classes were more miserable and wretched than another it was in their sleeping accommodation. As a means of circulating statements of principles, and diffusing information on this subject generally throughout the country, he thought an excellent plan would be, that the numerous applicants at the hospitals should each receive a tract containing information upon this matter, and pointing out the conditions that were necessary for the enjoyment of good health. By that means interest would be excited on the subject amongst the masses, and much good would thus be effected.

Mr. G. F. WILSON, F.R.S., said in the suburbs of London with which he was most acquainted, namely, Vauxhall and Battersea, the rents of ill-built, ill-arranged cottages, were from 6s. to 7s. 6d. per week. He thought architects and builders present would say that gave a sufficient interest for money for erecting well-built houses with five rooms well ventilated. The difficulty as to the collection of rents might, he thought, be overcome in localities where there were large manufactories, by an arrangement being entered into between the builder of the houses and the employers of the men, for stopping the rent out of their weekly wages. He felt quite sure the working classes would appreciate good dwellings at fair rents.

Dr. WALLER LEWIS congratulated the meeting on being presided over by so practical a philanthropist as the noble lord in the chair, who had done so much, both in his public and private capacity, for the improvement of the dwellings of the poor. There was one point with reference to ventilation of rooms which was more a chemical than a mechanical fact, and which was generally overlooked. It was thought by architects and gentlemen not very much accustomed to chemical analysis, that the whole mischief of the want of proper ventilation was owing to the loss of oxygen from the atmosphere, and the substitution in its place of carbonic acid gas. That was by no means the case. A series of carefully conducted experiments had been made by a French physiologist of eminence on this subject. He confined some birds in a close box, absorbing, by means of chloride of calcium, the carbonic acid, as rapidly as it was formed, while he supplied fresh oxygen as it was required, so as to keep the atmosphere in its proper chemical condition. Notwithstanding, the birds died rapidly, showing that the mischief arose from the animal exhalations which destroyed life. It was the same with human beings confined in close atmospheres. One thing specially, it was well known, tended to the overcrowding of houses, and that was the improvements carried on in large towns, which necessarily, by destroying the smaller houses, drove the working classes away from their former habitations. As medical officer of one of the largest Government departments, the Post Office, he had had opportunities of seeing the effect of that system. He had just completed a series of calculations, based upon inquiries relative to the domiciliary condition of the 2,000 persons employed in the Post office, and he found that of that number 513 were obliged to live at a distance from their work of 1 mile and upwards; 358 at a distance of 2 miles and upwards; 104 at a distance of 3 miles and upwards; and 47 at a distance of 4 miles and upwards; whilst some few lived at a distance of 6 miles and upwards. They were not only banished to a long distance from their work, but they had to exert themselves by walking double that distance, and if they had to appear at the office twice in the day, even four times that distance. It was also to be remarked that

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For the table were exhibited specimens illustrating the decay of Gutta Serena, as described.

in Mr. Highton's report. (See "Decay of Gutta Percha," given below.)

The Secretary announced that on Wednesday evening next, the 10th inst., a paper by Mr. J. Algernon Clarke, "On the Application of Steam Power to the Cultivation of the Soil," would be read.

DECAY OF GUTTA PERCHA.

The following report of Mr. E. Highton, to the Directors of the British Telegraph Company, is the result of further experiments made by that gentleman. It will be recollected that the results of his former investigations were given in the last volume of the *Journal*.*

"To the Directors of the British Telegraph Company.

"GENTLEMEN,—I beg to hand you several specimens of gutta percha-covered wire, and also sheet gutta percha, which have been experimentally subjected to the action of the mycellium of a fungus, viz., the *Agaricus Campestrius*.

"The gutta percha was placed in different parts of a bed of soil, 5ft. 6in. wide by 5ft. 3in. long. The spawn of the fungus was placed in the soil, at intervals, over that space, in the month of September, 1857.

"The mycellium traversed the whole of the bed.

"The gutta percha sent has not been touched by the hand or a tool until exhumed on the 25th of January, 1858.

"The several specimens sent will show the complete destruction of gutta percha by the mycellium of a fungus, and prove, I trust, the correctness of the opinion I expressed many months ago.

"Should the Company desire any further experiments, I shall be happy to make them; but I consider those already made by me so conclusive as to render further experiments in the same line unnecessary.

"I am, gentlemen, your obedient servant,

"EDWARD HIGHTON.

"London, January 28th, 1858."

The specimens referred to may be seen at the House of the Society of Arts.

SOUTH KENSINGTON MUSEUM.

The weekly course of lectures addressed to the working classes, explanatory of the collection of animal products, has been successful, attracting full audiences in the lecture theatre. Three lectures have already been delivered. The first, a general introductory one, on "The Animal Kingdom and its Economic Uses," was given on the 18th ult., by Professor Owen, F.R.S., Superintendent of the Natural History Department of the British Museum. The second, on the 25th ult., on "The Use of Refuse Animal Matter," by Dr. Lyon Playfair, C.B., F.R.S., Chief Inspector of Science Schools. The third, on "Shells and their Economic Uses," was given on Monday evening, the 1st inst., by P. L. Simmonds, Esq., of the Museum, in the absence of Dr. J. E. Gray, F.R.S., who was prevented by illness from attending. The lecture was illustrated by specimens from the Museum and Mr. Simmonds' private collection. Frank Buckland, Esq., Surgeon to the 3rd Life Guards, will deliver the next lecture, on Monday evening, the 8th inst., "On Horn, Hair, and Bristles."

During the week ending 30th January, 1858, the visitors have been as follows:—On Monday, Tuesday,

and Saturday (free days), 2,460; on Monday, and Tuesday, (free evenings), 2,247. On the three students' days (admission to the public 6d.), 630. One students' evening, Wednesday, 243. Total, 5,580.

SMOKE NUISANCE.

The following is the report of Mr. Cashin, the Corporation Consulting Inspector in Sheffield:—

GENTLEMEN,—Pursuant to your instructions, I beg to report that during the past year, in all cases in which you have directed a summons to issue for a breach of the smoke bye-laws, the full penalty has been inflicted, save in some exceptional cases, in which—looking at the fact that you desire not the imposition of fines, but compliance with the law—valid explanations were offered, and I did not feel at liberty to oppose an application for time to make alterations. In one case, however, that of Mr. W. H. Brown, of Harvest-lane, it was held that rolling-mill furnaces, even when connected with an engine chimney, were exempt from the operation of the law.

Progress has been made in the suppression of the smoke nuisance, but much has yet to be done to secure its permanent abatement. Inspector Wood's reports show that during the years 1855 and 1856 he had to record a discharge of smoke varying from 20 to 35 minutes in the hour from nearly all the chimneys of which he took observations—such cases are now the exceptions.

The bye-laws have not been harshly or rigorously applied; on the contrary, every effort has been made to carry them out in the most conciliatory spirit, and to make them as little irksome as possible to the class whom they affect. The committee have demanded not the absolute consumption of smoke, but so much as has been proved to be practicable; and in proper cases where efficient means had been provided for the accomplishment of this object, the engine-tenders have been proceeded against for negligence.

Many experiments, entailing serious expense and resulting in failure, have been tried; and much money has been spent in applying plans importunately forced upon attention which have been utterly useless. For such results it is sometimes urged that the committee are responsible, as they do not undertake to prescribe some particular plan. Apart from the objection that the employment or adequate payment of a competent person to direct the application of such plan would be opposed to public feeling, it is obvious that no one plan can meet varied requirements. Adaptation to meet the peculiar circumstances of each case is needed; and were the committee to exact the removal of the radical defects which exist in numerous instances, and which preclude the application of an effective plan, such mode of procedure would be more loudly objected to than the present. But, independently of this, it is clearly the duty of steam-engine proprietors, either by combined action or individually, to obtain efficient advice at their own expense and not at the expense of the ratepayers.

Another objection pertinaciously urged is, that the gases resulting from perfect combustion are more injurious to health than smoke. It is true that carbonic acid gas is injurious to animal life, but, under the circumstances, the objection does not apply. Carbonic acid in its natural state is specifically heavier than air, but as the result of combustion it issues from the chimney, not at the ordinary temperature of the air, but expanded by heat to more than double its ordinary bulk; it is then specifically lighter than the atmosphere in which it ascends and becomes diffused. No analogy obtains between this gas and a noxious mechanical mixture such as smoke. An excess of carbonic acid cannot exist in the atmosphere, the relative proportions of the constituent gases of which are constant, derangements arising from surface and low level exhalations being merely local and temporary.

* See Vol. V., pp. 294 and 436.

The prevention of smoke has for some time occupied the attention of scientific men, and no fact is better ascertained than that smoke is the result of a defective mode of supplying air to the crude gas evolved from the coal. The nuisance is produced by the carbonaceous mixture which passes off with this gas when the coals are clumsily burnt, without proper arrangements for the admission of air. To regulate the due admission of air, is the object generally proposed to be accomplished.

The present construction of furnaces and mode of applying heat demands a large continuous supply of atmospheric air, varying with the rate of combustion and the quantity and quality of the fuel.

If too much air be admitted into the furnace it absorbs heat, chills the flues, and reduces the temperature below the combustion point, causing smoke and a great waste of fuel. If an insufficient quantity be supplied, the hydro-carbonates—the constituents of coal gas—pass off with a large proportion of carbon in minute particles unconsumed. These carry with them not only the large quantity of heat which they are capable of giving out on combustion, but the heat expended in their elimination from the coal.

But so rude and imperfect is the present mode of construction, that with the best appliances and mechanical arrangements to assist the natural affinities and combination of the gases, more than double the quantity of air absolutely necessary for combustion passes through the furnace, carrying with it the heat which it absorbs. In an ordinary furnace it is found in practice that about 300,000 cubic feet, or eleven tons, of air pass through for every ton of coals consumed!

This materially affects the available heating power of the coal, which is further limited by the rate of combustion. With rapid combustion there is necessarily a sacrifice of fuel; more heat is generated in a given time, and consequently more water evaporated, but a large proportion of the heat is carried away by the increased temperature of the escaping products. With slow combustion more time is afforded for the heat to be taken up, and consequently more is utilized.

In all cases, however, a large amount of heat passes away through the chimney.

To remedy this primary defect in the existing system, an invention has been patented by Mr. Siemens, of London, which is applicable to nearly every description of heating furnace.

Mr. Siemens proposes to utilize the heat generated, and obtain therefrom the full equivalent of effect by using a regenerative furnace, in which he passes the air required for combustion through a regenerator, and the products of combustion—before they reach the chimney—through another regenerator, which consists of a chamber filled with fragments of refractory materials or firebricks, presenting a large amount of absorbent surface, to which the heat is communicated; the bricks or other substances nearest the fire become heated to a high degree of temperature; those next to them become heated to a less degree; and those at the other extremity comparatively little—the temperature gradually decreasing towards the outlet. Were this process to continue, the whole regenerator would attain the same heat as the escaping gases, which would then pass into the chimney as hot as when they entered the regenerator, and no good would result; but by a beautifully simple arrangement the inlet for the air and the outlet to the chimney are so connected with both regenerators (which are constructed of the same materials) that by changing a valve the current is reversed; the air passes through the heated regenerator and attains a high temperature before it reaches the fire, and the products of combustion pass through the regenerator, through which the air had previously passed in a contrary direction. When this regenerator becomes charged with heat, the valve is again reversed, and the alternate action continued.

By these means, with a minimum draught, intimate

mechanical contact and consequent chemical union of the gases are established, and the heat generated retained in the furnace—the products of combustion escaping at a temperature not exceeding 200° or 250° Fahrenheit.

Rolling-mill furnaces, constructed on this principle have been in use at Messrs. Marriott and Atkinson's some months; and in reference to them, Mr. Atkinson at a meeting of the Institution of Mechanical Engineers in June, 1857, stated that he "had a particular account kept of the coals consumed by a furnace on Mr. Siemens plan and one of the ordinary construction, and he found the total consumption of each, during six days, was tons in the ordinary furnace, and 1½ tons in the new; the work done by each being practically the same, in all circumstances alike during the time of comparison.

Mr. Brown, of the Atlas works, has also had two furnaces erected on the same principle; they are of a large size, for heating bar-steel, and on submitting them to trial the following results were obtained:—

Furnaces.	Time worked.	Weight of Steel heated.	Coals consumed.	Consumption of fuel per unit of work.
Old	10 hours.	145 cwts.	30 cwts.	21 lbs.
New	10 "	121 "	10 "	9 ½ "
Old	6 days.	77 tons.	26½ tons.	24 "
New	2 hours.	48 ingots.†	2 cwts.	4 "

* 60 per cent. less than the old. † 86 lbs. each (about 27 cwts.)

The invention is most valuable where the most intense heat is required; and the result of experiment shows that it may be applied to steel-melting furnaces. In melting steel by the present process, of the heat produced little more than 1 per cent. is made available. In investigating the operation of melting and the effect of coke, I find that the heat given out by the coke in combustion melts only 1-70 of the quantity of steel it is capable of melting if wholly utilized, thus showing that 98-5 per cent. of the heat generated is wasted!

It is proposed to apply the principle to engine furnaces and on the completion of the experiments I will communicate to you the results.

From the furnaces erected at Mr. Atkinson's and Mr. Brown's no opaque smoke escapes. I append a report of observations made on these and other rolling-mill furnaces by Inspector Wood. The ordinary principle of consuming smoke is not applicable to rolling-mill furnaces, nor do the bye-laws affect them; but when considered than an Act of Parliament has been proposed relating to the general prevention of smoke in Scotland and that an act is now in operation in London from the provisions of which no description of furnace is exempt. It seems more than probable that the Smoke Act will be extended to the whole country. It is more economical to anticipate the provisions of such an Act when a convenient opportunity offers, than to comply with them under pressure. In submitting these facts for consideration, I trust I am not departing from my proper province, but desire it simply to afford information that might otherwise possibly escape attention.

I have the honour to be, gentlemen,

Your most obedient servant,

T. F. CASH

16, Bank-street, Sheffield, 6th Jan., 1858.

WORKING MEN'S LIBRARIES.

The Society for the Diffusion of Pure Literature among the People, which is under the presidency of Earl of Shaftesbury, has issued a notice, stating that the liberality of one of their number, the committee

enabled to offer, at half-price, libraries of £5 worth and upwards of books for Working Men's Institutions, and similar bodies with a responsible committee or trustees, on the recommendation of a subscriber. The books must be selected from a catalogue issued by the Society. Any person applying for a library should describe the purpose for which it is wanted; and if the grant is passed by the committee they will forward a catalogue to be marked and returned by the applicant (together with the half price of the value of the library), when the books will be sent immediately. Applications should be made to the secretary, at the office of the Society, 9, John-street, Adelphi, W.C., where may be seen copies of most of the books in the catalogue.

Home Correspondence.

THE "ACCUMULATOR."

SIR,—My attention has been called to the following paragraph, forming part of the Chairman's observations at the meeting of the Society on Jan. 13th:—

"The water which was thus being constantly—day and night—stored up in this magazine of power, remained there subject to the enormous pressure which had been gradually overcome; it was accumulated as a store, to be used in three, four, six, or ten hours, as the case might be, and the apparatus, which was the patented invention of Mr. W. G. Armstrong, of Newcastle, was called an accumulator. He could speak most strongly as to the simplicity and value of this arrangement, by which it was obvious that wherever circumstances were favourable for the collection of streams at an elevation of even a few feet, the hitherto neglected power of such streams might be made available to a much greater extent than they could possibly have been under the system of water wheels alone."

I believe the accumulator has not been patented by Mr. Armstrong, but it will be found in a patent taken out by me in 1851.

I have reason to think, however, that a similar idea occurred to Mr. Armstrong about this time.

I am, &c.,

MICHAEL SCOTT.

26, Great George-street, Westminster, 1st Feb.

LORD PALMERSTON'S MORTAR.

SIR,—With all deference to the high authority of Mr. W. Hawksworth, I venture to point out some few inaccuracies in that gentleman's observations, inserted in your *Journal*, January 29th, upon my proposed steel-bred ordinance.

Mr. Hawksworth says that "the welding of such a mass of steel is open to serious objection." In the manufacture of ordinary gun barrels, the operation of welding the spiral, technically called "jumping," is extremely simple, and as the steel bar is intended to be rolled up on a mandril, in an absolutely close coil with clean faces, by means of a modification of the three cylinder rolls, one "jump" would weld the whole of that part of the coil that had been sufficiently heated, and no injury whatever could take place. Mr. Hawksworth goes on to say that "the cast metal jacket would most assuredly destroy the internal core by crystallisation." Large quantities of chilled cast-iron are used for a variety of purposes, and I never yet saw the iron mould affected by the heat of the melted metal. In the case of my proposed steel bore, it would be impossible to over-heat a mass of steel 18 inches in diameter, 4 inches thick in substance, and 12 feet long, with the addition of a cold iron mandril, fitting the bore, 10 inches in diameter, and two or three feet longer than the steel coil.

Mr. Hawksworth also says that "the shrinkage of steel is greater than that of cast-iron." This may be the case to a very small extent, but when it is considered that the circumference of the cast-iron jacket, three feet in diameter, is double that of the core, and that the latter is at a low degree of heat, the shrinkage will be found to be greatly in favour of the powerful compression and intimate union of the outside jacket with the steel core.

In regard to Mr. Hawksworth's own experimental gun, the result might have been readily anticipated, as cast-steel is well-known to be quite as brittle as cast-iron, and the hammering on a mandril would render it still more fragile. Cast-steel can only be brought into a state of toughness, exceeding seven times the strength of cast-iron, by repeated drawing, and not by hammering alone, which although it hardens and condenses, renders the steel more brittle than before.

It is a mere blacksmith's prejudice that cold hammering can render iron or steel stronger than it is in its natural state. It does become harder to turn in the lathe and to file, but, at the same time, its tenacity is destroyed; as, indeed, one blow too much will send the work to shivers. The steel-bar intended to form my spiral bore, is supposed to be drawn into the state of the utmost tenacity it is capable of acquiring, and all cold hammering, that is, below a cherry-red heat, has been carefully avoided.

I am, &c.,

HENRY W. REVELEY.

Poole, Jan. 31st, 1858.

To Correspondents.

ERRATA.—In the last number of the *Journal*, page 162, 1st col., line 56, for "Giult" read "Gwilt," and for "315" read "316." Col. 2, line 40, for "waste" read "water." Page 163, col. 2, line 13, for "752" read "52."

MEETINGS FOR THE ENSUING WEEK.

- MON. Architects, 8.
Geographical, 8½. I. Journey from Little Namaqualand eastward along the Orange River, the Northern Frontier of the Colony, &c., with Map. By Mr. Robert Moffatt, F.R.G.S. II. Route by the Rivers Walpi, Barama, and Cayuni to the Gold Fields of Caratal, &c. By Sir W. H. Holmes and Mr. W. H. Campbell. III. Preparations for the Departure of the Livingstone Expedition.
- TUES. Royal Inst., 3. Prof. Huxley, "On Animals and Plants considered Morphologically."
Syrro-Egyptian, 7½. I. Mr. Charles E. Harle, "On the Cylinder of Tigliath Pileser, and notice of a slab lately brought from Hoymijk, illustrating some passages in the Book of Amos." II. Dr. Heinrich Jolowicz, "On Egyptian Mythology."
Civil Engineers, 8. Discussion upon Mr. J. Henderson's Paper, "On the Methods generally employed in Cornwall, in Dressing Tin and Copper Ores." And, if time permits, Mr. J. A. Longridge, M. Inst., C.E., and Mr. C. H. Brooks, "On Submerging Telegraphic Cables."
Med. and Chirurg., 8½.
Zoological, 9.
- WED. Literary Fund, 3.
Society of Arts, 8. Mr. J. Algernon Clarke, "On the Application of Steam Power to the Cultivation of the Soil."
Graphic, 8.
Microscopical, 8. Anniversary.
Archaeological Assn., 8½.
- THURS. Royal Inst., 3. Prof. Tyndall, "On Heat."
Royal Society Club, 6.
Antiquaries, 8.
Royal, 8½.
- FRI. Astronomical, 3. Anniversary.
Royal Inst., 8½. Prof. Faraday, "On Static Induction."
- SAT. Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Jan. 29, 1858.]

Dated 21st December, 1857.

3127. William Thrift and Adam High, Stepney—An improved self-acting ship's water closet.

Dated 28th December, 1857.

3174. Henry Desmoutis, Paris—New metallic alloys.

Dated 7th January, 1858.

28. Eliza Graham, 14, Noel-street, River-terrace, Islington—An improved apparatus for threading needles.

Dated 11th January, 1858.

43. William Tregaskis, 37, St. Andrew's-hill, Thames-street—Improvements in the printing press.
45. Isaac Taylor, Stanford Rivers, Essex—Improvements in manufacturing metallic cylinders used in printing calico and other fabrics, and in imparting engravings to metallic cylinders used for such purposes.

Dated 12th January, 1858.

47. Edward Hammond Bental, Heybridge, near Maldon, Essex—An improved arrangement of portable gearing apparatus for the application of horse power, principally for driving various kinds of agricultural machines or implements.
49. John Henry Johnson, 47, Lincoln's Inn Fields—Improvements in boilers and heating apparatus generally. (A communication.)

Dated 13th January, 1858.

51. Charles Barlow, 89, Chancery-lane—An improved registering water meter. (A communication.)
53. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of coal and other fuel. (A communication.)
55. Patrick Robertson, 1, Sun-court, Cornhill—Improvements in inkstands. (A communication.)
57. Charles Edward Matson, Charles-street, Deptford—Improvements in roughing horses' shoes.

Dated 14th January, 1858.

59. Nicolas Eugene Jeanroy, Rue de l'Echiquier, Paris—Improvements in the manufacture of net lace.
60. William Woodcock and Thomas Blackburn, Sough, near Blackburn, and James Smalley, Blackburn—Improvements in machinery or apparatus for heating and circulating air, to be applied to all purposes where heating is required.
61. James Alexander Manning, Inner Temple, Middlesex—Improvements in the treatment of sewerage and other polluted liquids.
62. James Bradley, Saltaire, near Bradford—Improvements in apparatus used in weaving.
63. Joseph Stenson, Northampton—Improvements in the manufacture of wrought iron.
64. Henry Ingle, Shoe-lane—Improvements in printing machines.
65. William Clark, 53, Chancery-lane—Certain improvements applicable to the paying out of submarine or submerged telegraph wires or cables. (A communication.)

Dated 15th January, 1858.

66. John Varley, Albion Iron Works, Radcliffe—Improvements in steam engines.
67. Charles Schinz, Camden, New Jersey, U.S.—An apparatus for manufacturing prussiate of potash.
69. David Bowlas, Reddish, Lancashire—Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

Dated 16th January, 1858.

71. Richard John Badge, Newton Heath, near Manchester—Improvements in machinery or apparatus for drawing or extracting spikes or trenails from railway sleepers and chairs, and other similar purposes.
72. James Austin, Millale Mills, Donaghadee, Ireland—Improvements in machinery or apparatus for ploughing or cultivating land.
73. Robert Archibald, Devon-vale, Tillicoultry, N.B.—Improvements in the treatment or preparation of wool, and other fibrous materials for being spun.
74. George Macbeth, Manchester—A certain improvement applicable to sewing machines.
75. Frederick Hyde, Glossop—Improvements in machinery or apparatus for spinning, doubling, twisting, or throwing cotton, silk, wool, flax, and other fibrous substances.
76. Edwin Hills, Warrash, Southampton—An improved process for manufacturing sulphate of ammonia.

77. Patrick Robertson, Sun-court, Cornhill—Improvements in lamps. (A communication.)
78. Charles Amedée de Laire de la Brosse, Paris—Improvements in apparatus or machinery for the manufacture of looped or knitted fabrics. (A communication.)
79. Edward Rosa, Edinburgh, N.B.—Improvements in the manufacture of dough and other plastic or porous substances.

Dated 19th January, 1858.

81. Thomas Hamilton and James Hamilton, Glasgow—Improvements in holders or bobbins for holding or containing yarn or thread, and in turning, cutting, shaping, and reducing wood and other substances.
82. Andrew Walker and Thomas Walker, Shotts, Lanark, N.B.—Improvements in the treatment or preparation of moulds for casting metals.
83. Edward Wilson, 9, Rainbow-terrace, Worcester—Improvements in pistons for steam engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.
84. William Waller, Uddington, near Glasgow—Improvements in machinery for grinding, bruising, breaking, and cutting cereals, grasses, and other vegetable substances.
85. William Waller, Uddington, near Glasgow—Improvements in thrashing machines, or machinery for thrashing and dressing grain.
87. Peter Schuyler Bruff, Ipswich—Improvements in the construction of submerged tunnels.
89. Giuseppe Antonio Tremeschini, Vicenza, Venetian Lombardy—Improved methods and mechanical arrangements for applying card-board to the weaving of figured fabrics, and for arranging the card-board for this purpose.
89. Benjamin Blake Wells, Strand—Improvements in ordnance.
90. John Henry Johnson, 47, Lincoln's Inn Fields—Improvements in the boxes and journals of carriage wheels and axles, and in journals and bearings generally. (A communication.)
91. Thomas Pirie, Nether Kinnundy, Aberdeen, N.B.—Improvements in machinery or apparatus for thrashing or separating grain.
92. Philip Capon, Chancery-lane—Improvements in apparatus for binding together pamphlets, letters, music, and other loose documents or sheets.
93. Otto Von Corvin, Alfred-place, Alexander-square, Brompton—Improvements in the mode of inlaying or ornamenting metals and other materials.

Dated 20th January, 1858.

94. Christopher Nugent Nixon, Ramsgate—Improvements in the application of screw power, such improvements being applicable to steering apparatus, capstans, windlasses, cranes, winches, and other mechanical purposes.
96. Thomas Heppleston, Manchester—Certain improvements in machinery or apparatus for winding yarns or threads.
100. Charles Riahwood, Sheffield—An improved construction of spring for sustaining loads and moderating concussion.
102. John James Russell, Wednesbury, Staffordshire—Improvements in apparatus used in the manufacture of welded tubes.
104. Patrick Robertson, 1, Sun-street, Cornhill—Improvements in the manufacture of paints. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

January 29th.		February 2nd.	
2088. Thomas Markland.	2459. Alfred Vincent Newcio.	2802. Charles Edwards Amos.	
2087. Henry Genhart.			
2089. George Inman.			
2098. William Hopkinson.			
2100. Rd. Archibald Brooman.			
2101. George Brooks Pettit and Henry Fly Smith.			
2111. Charles Iles.			
2118. Thomas Lyne.			
2134. John Langford and Joseph Wilder.			
2155. William Pratchitt and Samuel Horrocks.			

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

January 28th.		January 29th.	
238. George Price.		1060. Edward Humphries and Thomas Humphries.	
January 27th.		January 28th.	
237. James Howard.		244. Thomas Ogden Dixon.	
		250. George Ritchie.	
January 26th.		January 26th.	
234. Arthur Lyon.		240. John Francis Porter.	

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4048	Jan. 29.	Invalid Bed Table	Armstrong Todd	Ardwick, near Manchester.
4049	Feb. 2.	Reflectors for Stereoscopes	Murray and Heath	43, Piccadilly.
4050	" 2.	Improved Stand or Fastener	William Cooper	Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 12, 1858.

DEPUTATION TO HIS ROYAL HIGHNESS THE PRESIDENT.

A deputation of Members of the Society of Arts, and of Presidents of the Institutions in Union, attended at Buckingham Palace on Thursday, the 11th inst., at 3 o'clock, to present a congratulatory address to His Royal Highness the Prince Consort, President of the Society, on the occasion of the marriage of Her Royal Highness the Princess Royal with His Royal Highness Prince Frederick William of Prussia.

The address, which was signed by upwards of ten thousand Members of the Society of Arts and of the Institutions in Union, was read by Mr. C. Wentworth Dilke, Chairman of the Council.

TO HIS ROYAL HIGHNESS THE PRINCE CONSORT, PRESIDENT OF THE SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

We, the undersigned Members of the Council, and Members of the Society for the Encouragement of Arts, Manufactures, and Commerce, and of the Institutions in union therewith, desire to present to your Royal Highness our heartiest congratulations upon the marriage of Her Royal Highness the Princess Royal with His Royal Highness Prince Frederick William of Prussia; and we sincerely hope that the fullest happiness will attend this union.

The long period of fourteen years, during which the Society of Arts has enjoyed the active Presidency of your Royal Highness, will, we trust, justify our seeking this opportunity to express our sense of the deep obligation which the Arts, Manufactures, and Commerce of the United Kingdom owe to your Royal Highness, for the constant and discriminating attention and the judicious acts by which you have promoted their progress.

We feel that the marriage of Her Royal Highness the Princess Royal with the Prince of a great Country so much like our own as Prussia, in the love of Arts, Science, and Industry, must tend to promote international friendship, and so extend and secure to both countries the peaceful and beneficent objects for the encouragement of which our Society is instituted.

These objects, we believe, form the soundest basis upon which the material interests of Nations can rest for advancing their political liberties, their commercial prosperity, and their social happiness.

The reply of His Royal Highness, the President, was as follows:—

I beg you to accept my warmest thanks for your kind congratulations on the marriage of my beloved eldest daughter with Prince Frederick William of Prussia.

This union, which, from the education and personal character of the young Prince, promises to secure the

permanent happiness of our dear child, could not but fill the hearts of both the Queen and myself with joy, and with thankfulness to Almighty God; but we have derived additional satisfaction and pleasure from the universally expressed sympathy, and participation in our joy, by the nation at large.

That this sympathy should be re-echoed by your Society, which, during fourteen years has commanded my best wishes, and any feeble assistance which I could render to it, must be most gratifying to me.

Gentlemen, these fourteen years, which have seen my daughter grow up from an infant, to become a married wife, transferred to a high sphere of usefulness in a foreign land, to which our most tender affection must still follow her, have also seen children of yours,—I mean the many plans and schemes for the promotion of Art, Science, and Industry which you have originated,—developed themselves, and grow up into independent life and power. Some of these have attracted the admiration of the world, whilst you could only follow them from a distance, with the fond eye of a parent who finds his highest gratification in the success of his offspring.

I am glad to find you accompanied on this occasion by the Deputations of the many Institutions throughout the country with which you have placed yourselves in union, and to have this opportunity of expressing to them my strong sense of the usefulness of their exertions for the promotion of the Education of the Adult Classes in this country. I trust they will at all times freely bring the result of their varied experience to the knowledge of the Society, to which suggestions coming from them must naturally be most valuable.

The undermentioned gentlemen composed the deputation, and had the honour of being presented to His Royal Highness by the Chairman of the Council:—

E. Akroyd, M.P., President, Haley-hill Working Man's College.

J. D. Allcroft.

J. G. Appold, F.R.S., Auditor.

Chas. Atherton.

Dr. Herbert Barker, Hon. Local Secretary.

Rev. John Barlow.

J. A. Beaumont, President, Beaumont Philosophical Institution.

Booker Blakemore, M.P.

Charles Bleeck, Pres., Warminster Athenæum.

W. H. Bodkin.

W. P. Bodkin, Highgate Literary and Scientific Institution.

H. G. Bohn.

Beriah Botfield, M.P., F.R.S.

Antonio Brady.

John Braithwaite.

William Bride, Mayor of Yeovil, Pres., Mutual Improvement Society, Yeovil.

Captain Bulkeley, Pres., Literary and Scientific Institution, Windsor.

C. S. Butler, M.P.

W. Button, President, Lewes Mechanics' Institution.

James Caird, M.P.

Lord Carnarvon, President, Newbury Literary Inst.

F. S. Cary.

Edwin Chadwick, C.B.

William Challinor, President, Leek Literary Inst.

Dr. Chambers, Member of the Council.

John Procter.

Dr. Prior Purvis, President, Greenwich Useful Knowledge Society.
 J. Allan Ransome.
 Charles Batcliff, Hon. Local Secretary.
 Robert Rawlinson.
 Alexander Redgrave.
 Sir John Rennie.
 Dr. Boget.
 J. Rooker, President, Bideford Literary and Mech. Inst.
 William Roupell, M.P.
 J. Scott Russell, F.R.S., Vice-President.
 J. Russell.
 Arthur Ryland, Pres. Birmingham and Midland, Inst.
 Bishop of St. Davida.
 Thomas Sanctuary, President, Horsham Literary and Scientific Institution.
 Sir H. P. Seale, Bart., President, Dartmouth Literary Institution
 Major Scoones, President, Society of Literary Enquirers, Tunbridge.
 W. B. Simpson.
 Sir George Smart.
 Sidney Smirke.
 J. Jobson Smith.
 James Snow, Pres., Lincoln Mechanics' Institution.
 R. T. Spiers, Honorary Local Secretary.
 J. B. Stebbing, President, Southampton Polytechnic Institution
 Colonel W. H. Sykes, M.P., F.R.S.
 R. W. Tamplin.
 John Thimbleby, President, Barnet Institute.
 Rev. T. Thomas, President Wellingborough Mechanics' Institution.
 G. S. Tolson, President Huddersfield Mechanics' Inst.
 Charles Towneley, President Burnley Mechanics' Inst.
 Matthew Uzielli.
 Cornelius Varley.
 S. Waley.
 J. H. Watherston.
 Daniel Watney, jun.
 W. Westley.
 The Marquis of Westminster.
 James Whatman, M.P.
 Heywood Whitehead.
 Josiah Wilkinson.
 G. F. Wilson, F.R.S., Member of Council.
 Thomas Winkworth, Vice-President.
 F. A. Winsor.
 Pres. Mechanics' Institute, Wisbech.
 W. Wood, M.P.
 M. Digby Wyatt.

P. Le Neve Foster, *Secretary*.
 Charles Critchett, *Assistant Secretary*.
 S. T. Davenport, *Financial Officer*.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.
2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to the Society's House, Adelphi, London, W.C., carriage paid.

The days for receiving articles are, Thursday,

the 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief but clear description of the invention, with a wood-block (when possible) for illustrating the Catalogue, and a reference to any publication in which the Invention is described.

All drawings exhibited must be framed.

ARTISTIC COPYRIGHT.

A Report as to the existing English Common and Statute Law, relative to this subject, has been prepared at the request of the Committee, by D. Robertson Blaine, Esq., Barrister-at-Law, Reporter to the Committee, and may be obtained of the Society's publishers, Messrs. Bell and Daldy, Fleet-street. Price Sixpence.

SPECIAL PRIZE.

A Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the Rev. F. Trench and J. MacGregor, Esq.,) and the Society's Silver Medal, is offered for a Writing-case suited for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following points, which will influence the Council in making their award:—

Lightness,
 Smallness of size,
 The avoidance (if possible) of fluid ink,
 Durability,
 Cheapness, with a guaranteed supply, and
 General applicability to the duties, habits, and requirements of the above classes.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 8th May next.

EXAMINATION PRIZE FUND FOR 1858.

The following circular letter has been addressed to the Members of the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., Jan. 30, 1858.

SIR,—I am instructed by the Council to inform you that the Examination Prize Fund for 1858 is now opened. The donations for 1857 were contributed by twenty-three Members, and there is a small balance to carry forward.

The Council draw attention to the fact, that last year's Examinations were limited to two centres. At these two centres, pupils from thirty-seven Institutions only presented themselves; ten of them were from the metropolitan district, London being one centre; sixteen from Yorkshire, Huddersfield being the second centre, leaving but eleven for all England, Ireland, Scotland, and Wales. This unequal distribution was one of the reasons which satisfied the Council that the system was not adapted to meet the wants of all the Institutions. They, therefore, resolved to bring the Examinations to the very d

DEAR SIR.—We have the pleasure to inform you that arrangements are being made on the attention of your Board of Examination of candidates for the first degree of the Society of Arts, at the following places:

Leeds.	Wakefield	Full
Bradford	Sheffield	4000
Hudders.	Middleborough	2000

The Examiners will meet in Easter week for the preliminary examination of the Candidates whose names have been forwarded to the Council of the Society of Arts. Questions, and printed Papers of Questions will be sent to the candidates. The final examinations of the Candidates to take place in Easter week commencing Whit Monday, 25th

... which will comprise the subjects of the programme published by the Society of ... to such institutions as may desire to ... with the Institutions where the ... are accepted, and each Institution or

Mr. Haskins, whose original views of this subject have moulded the designs of many inventors, and fully awakened the agricultural world to the importance of steam culture, teaches us to look beyond our familiar digging, ploughing, harrowing, sowing, and reaping, to the only possible modes in which the new motive-power can operate. We should analyse these processes; what is the end attained by them, and then endeavour to accomplish the desired result with a machine as essentially adapted to steam-power as the present horse.

hand implements are to animal-power. Investigating the nature of preparatory tillage, he finds it to consist in "comminution, aeration, and inversion," which it is possible to effect at once, in a single act, and with a simply-formed tilling instrument; and from the fact of horse-traction being horizontal, manual delving vertical, and the "favourite motion" of machine-work circular, he concludes (with an amount of argument and illustration which establishes and fortifies his deductions,) that some kind of "revolving cultivator" will ultimately be found best for being driven by a steam-engine. Accordingly, I am prepared to offer what, I believe, to be a new principle of rotary digging by steam-power, calculated to fulfil the various conditions recommended by theory or demanded by practice; but as an essay solely on mechanical tillage, so far advanced and a-head of the times, would be of little more immediate practical value than a history of past attempts and failures, I will first consider the application of steam-power to our existing order of implements.

At the outset let me remark that, although the "favourite motion" of steam machinery is circular, this is no valid reason why we should reject without trial every other kind of motion if suited to our purpose, seeing that the steam-engine employs rectilinear motion, continuous and reciprocating, and, indeed, all conceivable varieties of movement adapted to specific ends; and of all practical trials yet made, with the exception, perhaps, of Mr. Romaine's cultivator, far more favourable results have followed from applying steam-power to the haulage of traction implements, than from setting it to drive revolving cultivators. The wonderful rapidity with which steam-threshing has been accomplished, is owing to the circumstance that there was really nothing new to do; the engine had to turn a sheave (to thrash a sheaf) by means of a driving belt, just as it was accustomed to do in thousands of factories, only it had to be made portable. But working over so great an area as the surface of a field is a novel operation for the steam-engine, beyond the mere application of cogwheels, shafting, belts and brasses; and there is difficulty enough in finding how to apply the motive-power at all points of the surface in succession without staying to devise, in addition, more perfect tillage implements than we now possess.

To draw an implement such as the plough, which has been tested, improved, and adapted throughout many centuries, is a simpler and readier problem than to contrive a new description of tool for performing a hitherto unknown operation, involving, perhaps, a novel system of cultivation altogether; and as in thrashing, the implement will doubtless be speedily improved when once the new power has been applied to it. Again, there is no doubt that intelligent farmers everywhere are prepared to work traction implements by steam, whenever they are convinced that the present ploughing, scarifying, &c., can be done at less cost, all things considered, than by horses. A steam-plough is capable of instant and universal adoption, while a new tilling machine would not only meet with mechanical difficulties, but be a long time in achieving practical and pecuniary success against customs and prejudices cherished for generations. It will be wise to imitate those processes which are now found to produce the best effects, even though this may not be making the most advantage of the power that is possible.

In practice it is found indispensable that the staple of the land should be occasionally inverted—to bury surface weeds, stubble, sward, or manure, and bring up root weeds for extraction; also to fertilize the soil by the chemical and mechanical effects which follow both the exposure of earth that has lain long buried, and the burial of that which has been long treated by rains, dews, winds, frosts, and sunshine. This inverting, indeed, may be said to constitute the heaviest labour of tillage; if we can perform this, we can readily master any after-stirring

or pulverization. Breaking-up, without inversion, is getting into favour; but experience at Lois-Weedon and elsewhere shows that a tenacious subsoil should be exposed and weathered before being mingled with the staple. Mere granulation by scratching or rasping, mingling rather than turning over the mass so comminuted, has been proposed as the ideal operation we should aim to accomplish; but, however useful it may prove in some cases, I cannot regard it as calculated to meet all the necessities of our present practice, in which we find that, after certain crops and for various purposes, the soil must be cut or broken into pieces sufficiently large and tenacious to be turned bodily upside down. The pick or mattock may be a valuable tool in some countries—working with a minutely pulverising effect, and, at the same time, securing a more or less complete inversion—and the plough itself is in some climates a mere grubbing or ribbing tool; but with our moist soils and weeping atmosphere, our principal implements for performing the fundamental process of cultivation have been of necessity the plough that turns a furrow alee, and the spade that cuts and completely turns over a spit, the plough modified into many shapes, and the spade or fork made equally versatile in its adaptation to deep, shallow, light, strong, or stony land. Of these two implements the plough can be more easily actuated by steam-power than the spade: all hand tools being worked by several different motions intermittent and irregular, and so requiring complicated mechanism to imitate their action, while traction implements, moving with a continuous rectilinear motion, have simply to be drawn along, and with but little modification needful in their present form; hence, the solution of the steam-culture problem lying nearest to us consists in

STEAM PLOUGHING.

On light land, and where shallow work alone is required, the breaking up and inversion of the soil is done with great efficiency by the plough; and when we see the neatness with which leas are "tucked down" by our first-class skim-coultured ploughs, precisely that toughness being left in the alee which is so desirable on such land, we cannot think that any better implement need be there desired. On heavy land, where tillage makes a larger item in the expenses of management, and a cheaper motive power than that of horses will prove the greatest boon, the plough seems to be used merely because the horses cannot dig. The sledging sole does harm; the alices, not sufficiently subdivided, harden and make work for future dragging and reducing; and inversion is imperfectly effected, because a "harrow-edge" is necessary for securing a good "mould." Deep culture is also needed on most strong lands; yet, the farther we dig below the surface, the more is our horizontal traction at a disadvantage. A vertically descending tool appears to be required rather than a horizontally drawn one; and, perhaps, rotary diggers will ultimately be found as peculiarly adapted for penetrating and stirring up the subsoil from great depths, as traction implements are for tilling the upper stratum. Such lands will be grateful for a digging or trenching machine driven (not dragged) by a steam engine, whenever it is practically brought to the field. Meanwhile, the most effective implement for deep work on a large scale, in which manual digging is precluded, is the plough, with the subsoiler or trench-plough following. However, in spite of Lois Weedon husbandry, and the larger experience of the Yester farms, deep tillage is not so much sought after at present as a more rapid and economical method of performing ordinary ploughing. Instead of the slow trenching machine (although necessary to the renovation of clay-land farming), everybody is asking for steam machinery that can plough or equally well cultivate, at comparatively small cost, a great area of ground in a little time.

Steam-ploughing is not only possible, but is being actually done on a considerable scale; and, without

citing the long history of inventions for the purpose, I wish to consider the various plans now before the public—the results as far as yet ascertained, and then to make suggestions for further progress.

The first point is—How to apply the power to the implement? and the next is, the construction of the plough or ploughing machine.

As the material to be cut and turned over cannot be “fed” to our machine, we must take the machine over every part of the surface to be acted upon. Is the motive power then to be transported bodily over the whole area, as horses are, or is it to be transmitted from a distance? The idea of a locomotive power was the earliest, and certainly the most natural, from observing horse-labour, besides being a corollary from the invention of steam-carriages. And though it may at first sight seem ridiculous to harness an engine to an implement, as though its strength, like that of a horse, lay in its legs, yet we have the example of the railway locomotive, which exerts all its power by means of its (rotary) legs, yokes itself in front of a carriage, and pulls with traces, as a horse does. Working on a level and smooth roadway, the locomotive can drag a train of carriages more economically than a stationary engine can haul it with rope; and, allowing for the difference between a galloping railway speed and the sluggish pace required on an arable field, analogy would lead us to expect a like superiority of the locomotive, whether in pulling ploughs or vehicles. I need not enumerate all the attempts at locomotive engines for traversing arable land, but shall notice two only, one “theoretical,” the other practical.

The great weight of a steam-engine, with its water and coal, forms the chief obstacle to its transit over a soft or rugged surface; why not, therefore, employ a pneumatic locomotive? In 1839, Mr. Henry Pinkus patented a most ingenious method of applying an atmospheric vacuum, or else compressed air, as an auxiliary for conveying motive-power from a stationary engine to travelling implements. Now, without adopting his proposal of laying down air main-pipes about an estate, and distributing power (as Mr. Mechi does manure) from steam-pumps at the central homestead, might we not take his plan for connecting a light travelling pneumatic engine with air-pumps attached to a stationary portable steam-engine? A flexible tube, coiled on a cage-drum upon the pneumatic locomotive, is paid out as the locomotive recedes from the steam-engine, and wound up as it approaches. By passing and re-passing the steam-engine, a length of 200 yards may be ploughed with only half that length of pipe, and as this is merely laid down and rolled up again, very little wear from friction is incurred.

All doubt as to the effectiveness of pneumatic power applied in this way may now be considered as dispelled by the success of a compressed air engine at Govan colliery, near Glasgow, which has been working for more than six years without requiring any repairs or adjustment. The air-engine is situated half-a-mile from the steam-engine and compressing-pump, yet, as the pipe conveying the air is of large diameter, viz., 10 inches, the pressure of the air is diminished only 1lb. per square inch in passing through it. However, there is so much nicety and complication necessary in the compressing machinery, and in the apparatus for neutralising the great development of heat occasioned by the process of obtaining air at only 20lbs. pressure to the inch, that I think the principle must be abandoned, and we must give up, at any rate for a long time, the advantage of possessing such an extremely light as well as powerful locomotive power in our fields.

For making the steam-engine itself an agricultural locomotive—we have Mr. Boydell's “endless railway” —not describe in detail this admirable old idea. By bridging over hollows and planes over obstacles; by stepping,

as it were, instead of rolling, and laying down smooth even iron rails on which the wheels run; and still further, by bearing with flat platforms instead of curved wheel-tires upon soft ground, the shoes or rail pieces marvellously ease the progress of a ponderous machine. And thus the “traction-engine” can climb considerable gradients, as proved at the Salisbury agricultural meeting; and whether we adopt the particular form of engine there exhibited; or Mr. Burrell's appliances of the rails to common portable engines; or Messrs. Tuxford's compact and manageable engine on three wheels, in which both the main travelling wheels are driven, whether turning a curve or proceeding in a straight line; or Mr. Collinson Hall's enormously high-pressure locomotive, with its peculiarly-shaped boiler and steam-chamber maintaining the water levels always above the tubes—it is now clear that the farmer's engine may be independent of his horses, that it can draw from farm to farm the heavy threshing machine it works, and pull home the harvest sheaves or lead out those loads of farm manure which now tax the power of our teams so many weeks in the year. From the many experiments made and published, it is certain that the “steam-horse” can drag implements in moderately level land at a very expeditious and cheap rate; which is not surprising when we consider that the engine brings the implements, the coal and water enough for the day's use into the field with it; that no tackle has to be laid out and fixed, taken up and shifted, that the amount of manual labour required is very small, and the time lost in turning and removing comparatively trifling.

How long a traction engine will last in constant use I am unable to say; but everybody knows how the rough journeys of common portable engines tend to damage and deteriorate them; and though the rails prevent much of the shock and strain which would be otherwise felt, continual travelling over a hard and uneven surface like arable land must have an injurious effect upon a ponderous boiler and machinery. The weight of the rails is also a very serious item. The objection that the great weight is calculated to injure a strong soil by undue consolidation, applies to the traction engine as well as to horses, but not with greater force. For an engine of 8 or 10 tons traversing a field weighs but little more than the number of horses requisite to pull the same implements; and their feet penetrate and injure the ground more deeply than the broad platform rails.

It appears that a momentary emergence of the rails above the water level in the boiler is not dangerous; but for maintaining a nearly horizontal position upon inclines, might not ordinary boilers be supported at the middle of their length, and raised or lowered at each end by means of an adjusting screw?

I am very hopeful of the extensive adoption of the traction engine upon very level land, for ploughing and scarifying whole ground; but fear it would be impracticable for working land already ploughed, so much of the motive-power being wasted in carrying itself over rough and yielding furrows or large clods.

It is to be regretted that the adaptation of the plough to the traction engine has hitherto been so unfortunate as to prevent the accomplishment of a high quality of work. Mr. Smith, of Woolston, has just patented an improvement in the yoking of the implements.

Before quitting the subject of locomotive engines for traction, I ought to mention Mr. Halkett's recent proposed system of “guideways,” or rails laid 60 ft. apart over the entire surface of the land, for the convenience of the engine and tilling machinery. The advantages promised on clay soils are prodigious, but I believe not the less reasonable and likely to be realised; and would dwell longer upon the mechanical merits and economy of the plan, did I not believe that the outlay, of £25 to £30 an acre, effectually debars its employment to the tenant farmer, while there are but few estates, I suppose, on which landowners are likely to

it, or on which a public company might obtain power to operate. And I prefer to notice schemes of steam culture for tilling our fields as at present laid out, as more immediately practicable and available than those requiring the complete remodelling of estates.

For ploughing, and scarifying, &c., in a hilly country, we must have recourse to the windlass and rope as the best means of transmitting power from the engine to the implement; and it is a question whether this or the traction engine principle is best even for level districts.

Of several plans which have come before the public for working implements by a stationary engine and windlass, only one now survives. Mr. Fowler, having tried one method which wasted too much time in shifting the anchorages, and another which, though with these self-shifting, required a great length of rope, has adopted the system of moving both engine and windlass along the headland. Mr. Smith, of Woolston, adheres to the stationary engine and windlass; for though it involves the use and wear of wire-rope laid all round the field instead of once up and down it, and loss of power also in passing the rope round four anchored pulleys instead of only one, it enables him to employ a very compact form of winding-machine or capstan, and relieves him of the difficulty of moving the heavy machinery along the headland. The anchors at both ends of the work are removed at intervals into holes dug for them by hand labour, and a man is necessary to guide the rope into proper coils on the drums; so that with the engine-man, and a man and boy with the implement, five men and a boy are engaged in working the machinery, besides the horse and hands fetching water. The working cost of deeply breaking-up the soil, at 5 acres a day, including the shifting of the tackle, is 5s. 2d.; and of trenching and subsoiling (3 acres a day) 8s. 8d. per acre; the wear and tear being taken at 1s. 6d. per acre more. The price of the tackle and implement adapted to a common portable seven-horse engine is £220; and the experience of several farmers seems to show that it is worth while to lay out this sum, and then expend the above amount per acre for autumn cleaning and other preparations, even though ploughing itself may be left for horse-labour.

Mr. Smith's method of turning the implement at the end of its course, by simply having it yoked to the ropes by a "turn-bow" or hook in front, is the simplest and readiest possible. I shall refer to his system of tillage by-and-bye; ordinary "ploughing" not being included in it.

But may not this hauling by wire-rope with a stationary engine be pushed too far? When a very great length of running rope is out, the friction of the slack portions of the rope on the ground (the tight parts resting on friction-rollers), that of the pulleys or snatch-blocks on their bearings, the bending of the rope round the pulleys, and other conditions, consume a very considerable amount of power, besides occasioning a large amount of wear; and our object should, therefore, be to place the engine as near its work as may be consistent with no undue loss of time in shifting anchorages and turning the implement at the ends. This was the principle acted upon in the earliest practical trials of steam-ploughing, a medium between the travelling and fixed motive-power being chosen, by arranging the engine with its winding-mechanism upon the headland, and shifting it so as to be always opposite the ploughing. If we have two engines with coiling drums, one at each end of the field, and two implements moving in opposite directions, the ploughs will be at the least possible average distance from the motive-power. However, the very great prime cost, the cumbersome and difficulty of moving so much heavy machinery from field to field, the time lost in adjusting the two implements at the end of their work, and other considerations, are unfavourable to the scheme, except when ploughing is undertaken on a scale of great magnitude, and the engines are constructed so as to be perfectly capable of steaming their own way from farm to farm.

A better plan (indeed, the first ever brought into actual operation) is to employ one engine and winding-gear on one headland, and an anchorage and pulley on the other, both being shifted along as the work proceeds, and a single frame of ploughs being hauled up to the engine or pulley alternately. This is the plan adopted by Mr. Fowler; and, for comparing the saving of power effected, suppose a plot to be ploughed is 200 yards square, with a stationary engine and windlass the average length of rope running at once would be 600 yards, and the average distance of the implement from the windlass 300 yards; with a shifting engine and windlass, the average length of rope out is 400 yards, and the average distance of the implement 200, that is, one-third less. There is a further economy of power in having a direct pull upon the plough with one rope, and round only one pulley with the other, instead of round two pulleys with both ropes, as in the stationary windlass method. There is, therefore no doubt that Mr. Fowler could haul Mr. Smith's implements with greater results than have yet been attained by the latter gentleman's rectangular method of working the rope; so that it is the simplicity and lightness of machinery and apparatus, rather than economy in working expense, which form the favourable points of the Woolston system. One advantage of Mr. Fowler's plan is also that an unlimited extent of land may be ploughed with the same length of rope, fewer removals of the engine and tackle by men and horses being therefore required. I need not describe his ingenious anchorage, which propels itself onward, with its cutting disc-wheels always in the soil, forming a perpetual hold-fast or purchase, or the well-known engine with coiling-drums underneath, which also slowly creeps forward along the headland. A portable engine, by its inherent weight, forms such a capital fulcrum or resistance against the strain of the hauling-rope, that it was well to use it as such; but until we have the combined engine and windlass able to transport itself up-hill and along ordinary farm roads, I must view it as too ponderous and unwieldy for common farm use. One material point should be considered, namely, that to be immediately useful and successful, and patronized by the farmers generally, a steam-plough ought to be adapted to our present portable threshing engines, now distributed by perhaps tens of thousands throughout the kingdom. Mr. Williams, of Baydon, connects a windlass on wheels with a portable engine, by means of a strong framing; and though he has not been able, I believe, to work his ploughs without horses assisting, this portion of his plan is on precisely the principle I regard as most feasible and likely to meet with general favour. Mr. Fowler has adopted a similar method of enabling the farmer to avail himself of the engine he already possesses—the windlass-frame, mounted on large wheels, being so constructed as to embrace an ordinary engine like a pair of shafts, one end of the boiler being supported on this frame, and the other remaining upon its own travelling wheels. It does not take much time to unite or separate the engine and windlass; when joined, they propel themselves forward on the headland as one machine, and when separated, three horses can take either part from place to place.

At the trial at Stirling, Mr. Fowler's machinery, manufactured by Messrs. Ransomes and Sims, ploughed heavy land $5\frac{1}{2}$ inches deep, at the rate of $6\frac{1}{2}$ acres a day, for a total estimated cost of about 8s. per acre, which by horse-labour would have been 16s. per acre. On milder soil, 7 inches deep, at the rate of $9\frac{1}{2}$ acres a day, for about 6s. per acre, which by horses would have been 8s. per acre; and the trenching implement going $12\frac{1}{2}$ inches deep, ploughed at the rate of 5 acres a day, at say 11s. per acre, work which would need 6 horses for accomplishing only one acre in a day. The saving in the cost of ploughing we may reckon 35 per cent. on the loamy land, 40 per cent. on the heavy and say 60 per cent. in trenching; and it is here

...the strength in words and the strength

running empty to cross over the tight rope. For accommodating the length of the small rope passing round pulley, to the varying lengths of the furrow in different parts of a field, it must be shortened or let out from time to time by means of a few reserve coils carried on the ploughs. It would be an improvement upon the present mode of hooking the draught ropes to the implement if a "clip" were made use of, which could be instantly released by the ploughman; or if the ropes were wound round a small barrel, held from rotating by a pin, and allowed to revolve when the pull or draught was required to be stopped, in consequence of a stone, or other obstacle suddenly arresting the progress of the plough.

Now come to the second point—the construction of the plough or ploughing machine. And in the outset I should observe that we require a ploughing machine, and not merely a means of yoking separate ploughs held by ropes as before. When there no longer remain any animals to drive, and we have a steady, uniform unflinching light-power, why are we to retain the workman in a manual employment, and thus perpetuate our dependence upon his unskilfulness, carelessness, or fatigue? Men once relieved from the co-operation of horses, doing voluntary movements and wills of their own, nothing becomes a strictly mechanical operation; the attention and directing judgment of the ploughman are no longer necessary to overrule the animal power, and to accommodate the implement to its movements; and before I regard as incongruous and objectionable all attempts for steam culture with ordinary horse-ploughs pulled by hand. They are also expensive in labour, requiring more workmen than a ploughing machine does for the same number of furrows; and they are awkward, owing to the difficulty of conducting a succession of furrows close up to the headland, and turning or shifting so far the return course. Contrivances for meeting this difficulty I cannot but look upon as wasting ingenuity in a wrong direction.

Mr. Williams, Mr. Fowler, and other inventors, have actually demonstrated that several ploughshares and mould-boards united in a single frame may not only do the very good work, but also be of considerably lighter weight than single and separate ploughs, taking an equal number of furrows. Not only is the draught less, but power is gained in another way, by combining a considerable number of ploughs together. A rope pulling three ploughs, at a speed of three miles per hour, is added twice as far in the same time as a rope hauling a single plough at 1½ miles per hour; that is, the power used in dragging the rope itself is double in the former case than what it is in the latter, for the same quantity of work turned over, to say nothing of the double amount of wear. There is also a saving of time. If a three-furrow plough traverse the field in three minutes, and take one minute at the end, one quarter of the day is sacrificed out of work; whereas, if a six-furrow plough perform the journey in six minutes, the one minute at the end amounts to only one-seventh of the day. Let these considerations be borne in mind, while we proceed to notice various forms of ploughing machine used or proposed.

They are of two kinds—one for flat work, in which the furrows are all thrown one way; and the other for making "lands" or "stretches."

Turnwrest, one-way, or flat ploughing is adapted for light land, and may be practised also upon well-drained strong soils. The most successful steam-ploughs have hitherto been those constructed for this description of work, the advantage attending it being, that an implement, taking three or more furrows at once, can be worked without requiring to be turned round at the ends, and with anchorages gradually shifting along the headlands; whereas, in ridge-and furrow ploughing, such an implement must be moved across to the other side of the "land" or "ridge," and the anchorages shifted a con-

siderable distance forward or backward at every bout; while laying out the slack rope in the next track so far from the plough is also a difficulty. The implement having a simple to-and-fro motion, and the furrows all thrown the same side, it would appear at first sight very easy to fix two or three or more of Lowcock's turnwrest ploughs (with shares pointing both ways and self-adjusting mould-boards) in a frame, after the manner of the common double-furrow plough. But the difficulty is, that the ploughs must change their position sideways at each end of the work, in order to "track" rightly in going opposite ways. Lord Willoughby d'Eresby has displayed great ingenuity in providing for this necessity, but the space required for allowing the ploughs to pass each other places one so far behind another, and time lost in adjusting them is so considerable, that the principle is objectionable. There seems no other course than to have duplicate sets of ploughs pointing in different directions, one carried in the air while the other is at work. Messrs. Fiskien attach the ploughs to the ends of their windlass-framework, travelling upon two pairs of wheels, one set at each end, and both pointing towards the carriage. The set out of work precedes, while that in work follows the windlass-carriage, the ploughs in each set being just far enough apart to allow the furrow-lices to turn over without danger of choking. Each plough-body is affixed to a separate lever, answering to the common plough-beam, and by very simple mechanism is raised or depressed at pleasure. Thus, instead of the ploughs entering or emerging from the soil simultaneously, they do so in succession, so as to plough square up to the headlands. In the system of direct-hauling by wire-rope, in which it is indispensable to avoid unnecessary mechanism, in order to have the implement as light and simple as possible, we can hardly expect such niceties as this; and, instead of an arrangement of levers, chains, screws, and sockets for lifting and lowering the ploughs individually, I can imagine no better principle than that of balancing two sets of fixed ploughs upon a single pair of wheels, as adopted by Mr. Fowler. The frame, hung midway upon the wheels, with a set of ploughs at each end, is tilted so as to bring the hindmost set into work; and when arrived at the headland, the attendant has simply to pull down the other end and steer the implement in its next course when the rope begins to move it onward. The two sets of ploughs are immovably fixed upon the framing, pointing toward each other; the wheels, one running in the bottom of the furrow, left open at the last course, the other on the unploughed land, regulate depth and width of work, like the wheels of a horse-plough; and, by means of screws working in vertical standards, the frame can be adjusted upon the axle tree, according to the depth of ploughing required. The steering is accurately effected by slightly "looking" the wheels with a regulating screw, under the command of the ploughman, who rides upon the tail of the frame.

I attach great importance to the saving of time at the ends; and this is one reason for approving of the simple construction and action of Mr. Fowler's plough. One of the main advantages of this implement is the lightness of its draught. From numerous experiments with the dynamometer, it appears that the draught of common horse-ploughs, when out of work, is 30 to 35 per cent. of their draught when ploughing an ordinary furrow. Now, in Mr. Fowler's implement, this sliding of the weight of the ploughs on the furrow bottom, is entirely avoided, the ploughs at one end of the frame balancing those at the other, so that the entire weight is carried upon the large patent-axled travelling wheels. I have tested the draught of the 4 furrow plough running empty upon the surface of the land, and found it to be only 8 cwt.; the draught of 472 yards of wire rope dragging along the surface of a clover lee, was 3 cwt.; the total draught of implement and rope being no more than that of 4 common ploughs drawn empty on the same surface. Of course

with the rope supported upon friction rollers, the actual draught is much less.

I would suggest as an improvement, that this plough should be constructed say with two beams of $\frac{1}{2}$ iron shorter than the present wood beams, and with two diagonally placed beams at each end, made of tubular or angle iron, on which the plough skifes or the scarifying tines might be adjusted by clamps or bolts and screws, for different widths of furrow.

This implement which, by ready alterations can plough ordinary furrows, trench two furrows deep with an effect equal, in dry weather, to that of the spade, break up either whole or ploughed ground by cultivator tines, or pare with broadshares, seems to me just the convertible valuable implement we need in connection with steam-hauling machinery, as this versatility so materially reduces our first outlay.

I now pass on to a consideration of ploughing in lands, ridges, or stetches.

Steam-tillage ought to prove of the greatest assistance to heavy lands, and not only to light lands, which may claim the reaping machine as their gift from the mechanic, it being specially adapted to their upstanding crops; and from the restricted area of permanent subsoil-drainage yet in existence, as well as other circumstances, the great majority of farms on our strong wheat-soils are undoubtedly ploughed, and I fear must for many years be ploughed in ridge-and-furrow "lands."

It would be possible to form a land with Mr. Fowler's plough, first going two courses (that is, once up and down the field,) on one side of the ridge, and then, with considerable loss of time, turning the plough end for end, and going two courses to complete the other side; but, still better, the ploughs at one end of the frame might be left-hand, and the other right-hand ploughs, the implement then not being turned round. The slack or return ply of the rope following the plough would have to be laid out sometimes half a land's breadth aside from the track, and a guide wheel running along the last open furrow would be necessary to regulate the parallel distance of the next ridge. The anchorage, I think, would simply need to be shifted half a land's breadth at a time. But there is one objection. When we consider that one of the chief points of good ploughing is to form the sectional contour of the land in a proper curve, so that every furrow-slice shall be lower in regular gradation as we recede from the ridge (in order that the narrow edges of all may be equally prominent); and when we remember that a skilful ploughman secures to a furrow by adjusting the width, depth, &c., of each furrow according to its distance from and relation to the ridge in water furrow, and according to the previous shape of the ground, we perceive that no implement ploughing all its furrows one unvarying depth and width can be well calculated for this description of work. Perhaps Mr. Fowler may improve his ploughing-machine for such work, by giving the workman power to raise the length of either side of the frame without stopping the machine.

Mr. Williams works his single set of ploughs upon a carriage-frame, the ploughs being independently raised or lowered, but the machine has to be turned round at each end of the field at every course, and taken across to the other side of the field a difficulty which I believe Mr. Williams has not yet overcome without the use of horses—and the introduction of angles, &c., necessary for different courses would occasion considerable delay. But it is unnecessary for such ploughs to have a "swimming" motion in the water. There appears to be no practical objection to the employment of a considerable number of ploughs firmly fixed in a frame, but, on the contrary, the introduction of framing and adjustments in proportion to the breadth of ground operated upon (so important in harnessing the land to be drawn) is in favour of such an arrangement. We might turn the land at a time,

if the machine would not be too cumbrous, so that when the ploughs are once "set" (with regulating screws, &c.), to their proper depth and position, according to the form of the surface to be ploughed, no alteration whatever would be necessary. But a frame of six or seven ploughs following each other, would be too long and unwieldy, therefore, let us turn half the furrows one way and half the other, the ploughs being in two sets, placed abreast, instead of following one another. The six ploughs will thus occupy only the same length of frame as three; the machine, indeed, with wheels in front and behind, will be of much the same dimensions as a scarifier. Mr. Coleman exhibited at Chelmsford a ploughing machine of this description, in which the ploughs were arranged in a V form, like a flock of wild fowl. Suppose we attach the ploughs to the bars or beams of the framework by a fastening somewhat similar to that of Bentall's broadsharer, so that they can be adjusted to different depths and widths, according as the ground may be level or in ridge and furrow. By raising the fore-end of the frame upon its carriage wheels (with a wheel-and-screw or lever movement), the ploughs are run out of work of their own accord, and by depressing the front, they are pointed in. Let there be two implements, ploughing only up to the windlass—in accordance with the method of hauling described in a previous part of this paper. One is to "gather," or turn its furrows inwards, forming a ridge in the middle, the other is to "split," throwing its furrows outwards, leaving an open water furrow in the middle; that is, the first implement makes "ridges," or "feerings," of a certain distance apart, and the other "makes up" the intervals, forming complete lands or stetches. Carriage wheels follow in the last furrows to sustain the weight of the implements, and for them to travel upon as they run backwards out of work. The manner in which the two implements would be worked, with a minimum of time lost at the ends, and a saving of power in several respects, has been already sufficiently described. I need merely refer now to the advantages of making the ploughs in each frame turn half their work opposite ways, and to the possibility of lightening the draught by avoiding sledging and sliding action as much as possible.

From numerous dynamometer experiments, it appears that in a heavy soil, if the whole draught of a plough in work be taken as 100, then, with the mould-board removed, it will be 90, drawn along an empty furrow it will be no less than 35, leaving 55 to represent the power required for cutting the slice. Much of the 35 per cent. may be saved by supporting the implement upon three or else four carriage-wheels, and shortening the sole as far as it can be done without causing the share to make a ragged uneven furrow-bottom. The 10 per cent. due to the action of the mould-board may also be reduced; for though the weight and friction of the soil upon the upper surface of the mould will remain, the weight lifted (several stones) may be mainly sustained by the travelling wheels, instead of borne by the alledge formed of the sole and the heel of the mould-board. The 55 per cent. due to the operation of the share and coulter, must not be supposed to arise merely from the dividing of the soil by their cutting edges; the share has a considerable weight of earth resting upon it, not only occasioning great friction upon the upper surface of the share (which cannot be obviated), but greatly adding to the pressure and friction of the under side of the share upon the furrow bottom. By forming the ploughs in our machine so that no part shall touch the furrow bottom, except a small portion of the share edges and soles, and by bearing the entire weight upon wheels of considerable diameter and broad peripheries, (or, perhaps, applying the "endless rails" to prevent sinking,) a very large proportion of the friction, cohesion, &c., of the horse plough may be dispensed with. There is also another consideration. A common plough exerts a great side pressure against the upright land side of the furrow, owing partly to the re-

action of the furrow-slice in turning over sideways, but principally occasioned by the diagonal direction of the share's cut. If the cutting edge of the share make an angle of 45° with the direction of the plough's advance, there will be a pressure against the side of the furrow equal to that needed to overcome the resistance directly in front of the share. But when we fix two sets of ploughs in a frame, half having right hand, and half left hand shares, instead of any side thrusts being taken with a sliding action upon the face of the furrow, the side-pressures of all the ploughs neutralize each other. By proper attention to these points, I conceive that an economy of power would result.

I have not time to detail the simple steering by slightly locking the axle of the front wheels, the adjusting of the hind wheels to make them act partially as "soles" to the ploughs, or the short coil of reserve rope and the clip by which it is held. I need merely add that all the arrangements might be very simple, and that the implements would travel with their wheels partly running on the unploughed ground, but chiefly along the smooth and clean furrow bottoms, and only for an instant cross over the ploughed land. Of course the draught of a large implement taking six furrows at once must be heavy, but the load is sustained by the windlass and not by the anchorage. Perhaps the chief objection is the difficulty of making furrows of equal depth on uneven land by an implement of such great width.

Having now concluded my review of steam-ploughing properly so-called, and offered various suggestions for its better accomplishment, I must briefly allude to

NEW PROCESSES, ROTARY FORKING AND DIGGING.

First. Implements operating by Traction.—Mr. Smith, of Woolston, is very successfully carrying out a novel system of tillage, by means of trenching, subsoiling, and grubbing implements, without using the common plough, except for turning over clover lea and sward land, and this, indeed, he thinks to be hardly necessary. He combines subsoiling tines with the double-mould-board plough, and follows with the single subsoiler, so that the land is left ploughed up in "drills" or "ridges," the subsoil at the bottom of the open furrows and trenches broken up and exposed to the atmosphere, while the strips of ground covered by the upturned furrow slices are also stirred and disintegrated. On all soils that are not thin or light, this must be a remarkably effectual fallow process; the partial inversion and complete stirring exposing such a large proportion of the staple and subsoil to atmospheric action. The subsoiling tines are exceedingly efficient, somewhat resembling spades, or square fluked anchors, in shape, and so sloped as not only to enter and pulverize deeply the entire breadth of a furrow each, but also to raise a considerable portion of the subsoil for admixture with the upper staple. And the various cultivators used (manufactured by Messrs. Howard, of Bedford,) are remarkably simple, strong, and effective, and possess very admirable contrivances for steering, raising and lowering, and turning round. My paper being confined to mechanical methods of applying steam power to tillage, rather than referring to tillage itself, I say no more here, except that Mr. Smith's land and crops testify to the soundness and value of his husbandry upon very heavy and also upon some other qualities of land; and his experience, fortified by that of various agriculturists, shows that there is economy in expeditiously breaking up ground by these implements at a total expense of 6s. 6d. to 10s. per acre.

We have been long familiar with the revolving harrow, forker, or scarifier, as brought before the public by Mr. Gibson, of Newcastle-upon-Tyne, Mr. Samuelson, of Banbury, and other inventors. And I believe the decision of practical judges respecting them to be that, while they may be admirable in certain cases for stirring ground already tilled, they are not able properly to break up and invert unploughed land. However, I do not quite

despair of this form of digger for effecting the first and principal operation of tillage. Mr. Smith, of Lois-Woodon, has contrived an implement of this kind which answers perfectly well for pulverising and lifting up the subsoil from the bottom of the trenches previously ploughed along his "intervals," casting the furrow-slices of staple underneath, and depositing the subsoil upon the top. The tines (of proper cycloidal curve), instead of being arranged upon separate discs, forming a set of independently-revolving rowels, are all fixed upon one barrel; as the machine advances, the earth is crumbled and raised bodily by the teeth, and while it hangs momentarily suspended in air before being cast off by fixed scrapers, a couple of small mould-boards gather the upper soil (previously turned by a plough) on each side into the bottom of the trench, the earth from the digger falling upon it.

Could not a simple implement of this character be made for ordinary husbandry, in which the whole surface has to be cultivated? Suppose a similar digging cylinder or wheel, to take only the width of a common furrow, preceded by a couple of skim-coulters or small ploughs, that would pare the stubble or sward, and cast it into the furrow left open at the previous course; then the earth raised by the digger might be diverted as it fell by a sloping mould-board, and laid upon the top of the thin slice deposited by the skim-coulters. In this way a perfect inversion and burying of the surface would be secured, while at the same time there would be a thorough comminution of the soil, and no pressure or sledging upon the furrow bottom. I think the draught of such an implement would be comparatively light, as the weight would all be supported upon the axis of the digging-wheel, and help to force the tines into the ground. The implement would also be very convertible; for, by taking off the mould-board we should have a rotary subsoiler instead of a trencher, the soil being mixed instead of inverted; and by adding other digging-barrels on each side, we might have a wide grubber or cultivator. For the purpose first mentioned—that of ploughing or trenching better than the plough—perhaps it would be equally efficient with the combined implement, proposed I believe by Mr. Fowler, in which a furrow-slice is ploughed the full depth, turned precisely upside-down, and then broken by the points of Norwegian-harrow rowels following upon it.

Hanson's potato forker is another form of rotating pulverizer; could not Mr. Fowler apply the revolving blades or tines to cut the furrow slices of his plough crosswise? Motion might be derived from one of the travelling wheels, and thus ploughing and pulverizing would be accomplished in a single act.

Leaving now the traction principle altogether, which, in the case both of ploughing and scarifying by steam must be now pronounced fully successful, let us inquire into the merits of

MACHINES ACTUATED INDEPENDENTLY OF TRACTION.

I dismiss without notice multitudinous contrivances for imitating the motions of manual digging, partly because they would demand more space than I feel at liberty to devote to them, and partly because I prefer, for simplicity and practicable character, machines having a continuous circular motion and few working parts; and indeed, I believe, that ultimately the highest order of results which steam-culture will ever attain, will be by a revolving tiller, because, theoretically, it is best adapted to the new motive-power.

The idea of Mr. Hoskyns, that a cylinder of claws, tines, or cutters, should be attached behind a locomotive engine, and driven at a more or less rapid speed by the motive-power, notwithstanding the success of steam-traction implements, never promised better than it does now. I do not know what has become of Mr. John Bethell's revolving forker, but, at any rate, Mr. Romaine's machine, in the hands of Mr. Alfred Crosskill, is

with the rope supported upon friction rollers, the draught is much less.

I would suggest as an improvement, that it should be constructed say with two beams shorter than the present wood beams, and with diagonally placed beams at each end, made of angle iron, on which the plough skids or runners might be adjusted by clasps or bolts to make different widths of furrow.

This implement which, by ready alteration, can trench ordinary furrows, trench two furrows of equal, in dry weather, to that of the ordinary either whole or ploughed ground by an ordinary pair with broadshares, seems to me a very valuable implement we need in connection with our hauling machinery, as this versatile implement reduces our first outlay.

I now pass on to a consideration of the ridges, or stetches.

Steam-tillage ought to prove of great value to heavy lands, and not only to heavy lands, but claim the reaping machine as a valuable implement, it being specially adapted for crops; and from the restricted drainage yet in existence, as well as the great majority of farms are undoubtedly ploughed, and to be ploughed in ridge-and-furrow.

It would be possible to use a

plough, first going two courses down the field,) on one side, and then, after a considerable loss of time, to go back to the end, and going two courses up the field, but, still better, the plough might be left-hand, and the implement then to return to the first or return ply of the plough, and have to be laid out from the track, and the last open furrow parallel distance, I think, would simplify the breadth at a time.

we consider that the proper curve, so as to form a regular gradient, that the harrow and when we have this form by the furrow across the ridge or wheel shape of the ploughing, the breadth each course of work. Perhaps the machine must be altered to alter the stopping to the

Mr. Williams levers capable of each ploughing the machine to work at every of the land has not yet the alteration of courses, must be necessary for independent obstacle to the ploughs right the lightness to the breaking loosening the arrangement.

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... from the other side of the trench, leave
... position.

These cutters are to be affixed by radial
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... and let the machine advance at
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... instead of transverse, just as in
... and Huckvale's turnip thinner.
... supported and actuated in a
... (noticed,) proceeds sideways, as
... trench, slicing off spits from
... workman does with a spade, and
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The "bite" or thickness of the spit
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... on the same shaft. Working at least
... might be increased. For going 12
... deep, the disc need not be of greater
... three, or at most four feet. And it is
... though of small diameter, as the digger
... the trench, a spur-wheel of considerable
... on the same shaft to drive it. I pro-
... machine should traverse up and down the
... turning at the ends, the digging disc
... in the trench and revolving the same
... change necessary is to point the cutting
... angle when the machine is to travel
... and this is done by setting each arm or
... set, and connecting the six arms so that
... round simultaneously. The blades are
... in order that they may be turned round so
... the arms into operation as coulters, whichever
... machine may be moving. But the form of
... is also adapted for revolving upon a
... shaft or cylinder like Romaine's.

It may be communicated to the digging-wheel
... ways. It may be affixed to a locomotive
... but I should prefer to drive it by an endless
... on friction-rollers, in connexion with
... engine, or an engine shifted along one end
... —a modification, in fact, of Mr. Atkins' and
... taken's method. For a single digging-disc, per-
... would not be too great a resistance to be driven
... work from the travelling-wheels of the carriage-
... on the principle of Hanson's potato-digger: the
... having teeth or cogs upon its felloe to give it a
... of the ground, might travel along the bottom
... trench, and so partially operate also as a sub-pul-
... breaking up the hard bottom, and, as the dig-
... disc is adapted to a pace of 2 miles per hour, horses
... work it if required. I would suggest, however,
... in case the bite and resistance thus obtained were
... insufficient for very deep work, a couple of wire-
... ground upon the drums of the machine, and
... down at both ends of the field by shifting an-
... would cause the drums and connected gear-work
... receive by the simple advance of the machine;
... this travelling windlass would involve consider-
... and complexity.

Description of this rotary digger is very general
... of details, the rather rude drawings accom-
... this paper merely giving some idea of the cir-

cular cutting and inverting of a movement I advocate,
and, in fact, it is not the particular form, but the dis-
tinctive principle of action involved, that I wish to
bring before you.

In conclusion, let me hope that at least some of my
suggestions with respect to working traction implements
by steam-power, and the construction of new tillage ma-
chines, will prove useful to some gentlemen who may be
practically grappling with the mechanical difficulties in
the field, and that the principle I have introduced to
your notice for deep-digging and perfectly inverting the
soil, with the least possible waste of power in raising the
cut pieces, will meet with your consideration and ap-
proval.

DISCUSSION.

The following letter has been received by the Secre-
tary:—

SIR,—In the *Journal* of this Society for February,
1866,* are a few remarks, I then made, on the subject of
ploughing, or land cultivation by steam-power. These
impressions were arrived at, and forced upon my mind by
the importance of the subject, and by frequently witness-
ing the various methods (ingenious and persevering) by
which the desideratum was sought to be accomplished.
I would now frankly have renounced my ideas, and cor-
dially have congratulated any inventor who had, by
this time, made the progress then hoped for, and which
their great efforts have really deserved; but feeling, as
I do, that so little improvement has been made in the
art by any of the methods during these two years, I am
more convinced we are not yet in the right path to the
possession of an implement such as would generally super-
sede the good horse plough, and which the enterprising
agriculturist would hail with pleasure and readily adopt.
Sincerely feeling, as I do, how very ungenerous and hard
it may seem to these energetic pioneers to dwell on their
unrewarded efforts, I would gladly adopt any course of
remarks or argument, which would avoid allusion to a
failure, or touch a disappointed hope, and would, there-
fore, briefly state that from all I have yet seen or heard
of improvements and trials of the now existing means, I
am forced back to the conclusion I had arrived at in
February, 1866, that the thorough and practical steam
cultivator is to be wrought out of such a construction of
machine as I then sketched. It may, with seeming
justice be asked, why I disapprove of all existing
plans, and still do not produce my own idea in a competi-
tive form. My answer is, that during these years I
have, through impaired health, been compelled to relin-
quish, in a great measure, the practical management of
our somewhat large manufacturing business, and those
left to do so find their heads and hands full enough in
grappling with the large and small details of works re-
quiring increasing attention.

The machine I had sketched in 1866, I still think well
worth the consideration of one or more possessing the
ability and bold determination of some of the gentlemen
I have alluded to; and should success be theirs, I will be
satisfied with that which is only due to me, for having
pointed to the outline of an implement for so desirable
an object. I would very shortly repeat, that the machine
I proposed was in the form of a portable engine, not
much exceeding in weight and size that now used to work
a combined threshing machine; the addition and differ-
ence would consist in a frame containing a number of
digging spades, and the application of the engine's power
to the up and downward motion of the spades, and turn-
ing over the pieces of soil they lifted much in the same
way as a man does with a spade. I think I may fearlessly
assert that no plough has ever equalled the spade in be-
neficial results to the soil and its productions; the ex-
pense and insurmountable difficulty of having the work

done within the necessary time by men being the objections; and, if so, then the implement we really require is some twenty or more spades worked by the uncomplaining giant steam, so obedient and untiring. The arrangement of the spades, and their required motion are not insurmountable difficulties in the science of mechanics, while the engine's weight, instead of being a drawback as at present, would be the intermediate power by which I would force the spades into the ground, and these spades would act as so many levers, by which the machine would be moved step by step. No space, whether the field was large or small, would be left untilled any more than in the case of the best ploughing, and the digging would be deep or shallow at the option of the attendant, or as the frame had been set for him. No power would be mispent; the whole apparatus would be as free from derangement as the portable engine and threshing machine now are, and quite as portable; for when the work was done, the spade frame would either be lifted clear of the ground, or disengaged, and the travelling wheels left free for locomotion. In common with so many, I long to see an efficient machine for such a great work; and if my ideas should now fall into genial soil my object is served.—I am, &c.,

RICHARD GARRETT.

Lelston Works, Saxmundham.

The CHAIRMAN said this was a most important subject, for he thought that we were in a state of transition as regarded the cultivation of the soil. He had no doubt that, in process of time, the ingenuity of this and other countries combined would bring steam-ploughing, as well as reaping by machinery, into general use. More attention was required to the machine itself than to the engine which was to work it; the latter might be considered as having been brought almost to a state of perfection. He had an opportunity, at the Paris Exhibition, of witnessing the operations of from twelve to fifteen different steam reaping-machines, and he had reported upon them to the Government of this country. Throughout those experiments, it struck him very forcibly that more was wanted from the farmer than from the engineer, inasmuch as a great deal depended upon the land being brought into a state fit for the application of machinery. Until attention was paid by the farmer to this point, it was in vain for engineers and inventors to bring forward machinery for the cultivation of the soil. It appeared to him that, in good cultivation, the first step was to carry off the surplus water by a complete system of drainage, to increase the depth of the staple, and to bring to the surface portions of the subsoil. He believed, if those necessary preliminaries were carried out, they might apply machinery to the cultivation of the soil with good effect, and at a cost which would be within the means, not only of the gentleman-agriculturist, but also of the tenant-farmer. He saw many practical men present, and would be happy to hear their observations on this highly-interesting subject.

Mr. J. J. MEECH was of opinion that steam-cultivation would, ere long, become the custom of the country. He would mention that two years ago Mr. John Fowler ploughed a quantity of land for him, and he could assure them of the marked superiority of the crops on the land so treated, as compared with that subjected to the ordinary horse-ploughing. There was a difference in the crop of wheat, of at least a quarter per acre in favour of ploughing by steam. The superiority was apparent from the first appearance of the crop, and was maintained up to the time of harvest. The depth to which the land was ploughed was considerable, and, in addition to this, subsoil ploughing was also employed. The work was allowed, even by the have been done with much greater regularity affected by horse-ploughing, and fresh soil to the surface which had never before been by implement. It was true the work was

done some little time before the crop was sown, and he doubt the action of the air upon the raw subsoil was beneficial. He thought they would all agree as to the superiority of steam over horse-power, wherever it could be brought to bear. An acre of ploughing per day was considered fair horse work, and that would be done by 6 o'clock in the afternoon, at which time the horses turned to the stables, and remained there eating and sleeping till 6 o'clock the next morning. In the summer months especially, an immense amount of time was thus wasted, and the horses must be kept and whether they worked or not, so that all experience had to show that horse-power in the cultivation of land was but a make-shift, and must, he thought, ultimately succumb to mechanical contrivances. His impression, a year ago, was that Romaine's engine would be effective, and he had spent some £700 in experimenting with that machine. Since then he believed £10,000 had been expended in experiments, and with very important results. He had no doubt larger sums yet must be expended before they arrived at perfection, and every year would witness large improvements in the application of steam-machinery to the purposes of agriculture, as was the case with regard to manufactures. He hoped the farmers of the country would be sufficiently alive to the importance of adopting these appliances when they were brought to them. It was certainly not the duty of the Government to lay out their money in making these experiments, but at the same time they ought to be willing to pay a fair remuneration to those who afforded them the means of carrying on superior cultivation at a cheap rate. By the facilities of inter-communication afforded by railways, many local prejudices had been abolished, and districts which formerly prided themselves that they were in the van in agricultural matters, discovered much they were behind-hand. After all, depth of cultivation after good draining was the true master-key. If the subsoil be brought into contact with the atmosphere, they would find a treasure which had never before been developed. He had every year increased the depth of cultivation on his land, and had always been rewarded for it. Recently he had a field dug all over with steel digging fork, and he had found it more economical in its results than ploughing with horses. There were five horses ploughing in one field, and in another four men fork-digging, and he found the latter did the work at £2 per acre, the men earning 2s. 6d. per day, the work of five horses and two men in ordinary ploughing. The more he saw of horse power the more convinced was that it was the worst and most costly power that could be employed, but at present the use of it was unavoidable.

Mr. J. ALLAN RANSOME said, that the very able report they had heard was certainly a most accurate record of all that had been done in the application of steam-machinery to agricultural purposes up to the present time, and many of the suggestions put forth, he felt, were extremely valuable. On the two previous occasions, which he had attended discussions on this subject, practical progress in this direction had been shown to be extremely limited. With the exception of a little that was carried on in one season on Mr. Smith's farm, not much had been practically done when the subject was discussed in that room—at least so as to induce others to follow in the same steps. Since that time great improvements had taken place in the three leading plans referred to in this paper, namely, first the locomotive traction engine drawing an implement after it; secondly, the steam-engine employed to give motion to rotary machinery; and thirdly, the employment of traction engines with a fixed engine. He had already expressed his opinion in favour of traction by means of stationary engines. His attention had been principally directed to the latter system, from the belief he entertained that the practical results would be derived from it. Looking at the results of Fowler's method of steam-ploughing

had up to the present time been found very effective. This was shown by the fact of a 12-horse engine working five ploughs during the week, at the rate of 10 acres per hour. To accomplish the same work with horse-power, would take 16 horses. The number of men in the one case was five, and in the other eight; in the one case they must be all skilled ploughmen, whilst in the other they required only one person competent to drive an engine, another able to guide the ploughs, and the remainder could be done by boys. It was further to be remarked that, during the necessary period of rest and feeding both for men and horses, the steam-engine might be employed in other operations on the farm. He would now speak of another class of implements. The plough was universally admitted to be inferior to the spade. Why was that so? There must be some detrimental effects produced in ploughing which must be set against the good done to the land. In the first place, there was the treading of the horses' feet, and, in the next place, the hardening of the soil by the action of the broad bottom of the plough. He regarded the implement which had a tendency to break up and comminute the soil as the nearest approach to perfection; and where the steam plough had been introduced with the avoidance of friction, and where the soil was broken up by an implement following in the wake of the plough, he believed it was quite equal to the process of digging, and he thought this might be effected by the traction rope and fixed engine. At the same time, he thought that a lighter description of engine might be adopted which could be used as a rotary travelling engine. Whilst there was work sufficient for each manufacturer his individual line, he thought ploughing by traction had been almost brought to perfection; but with regard to a thoroughly practical digging machine, he feared that the probability of success was rather remote. The necessary complication of such a machine would stand in the way of its success. He lamented as much as any one that the state of his friend Mr. Garrett's health had delayed his further progress in that direction, but his friends might console themselves that he had thus been released from a matter which would certainly have occasioned him a great deal of anxiety; and in the event of Mr. Garrett's restoration to health, he (Mr. Ransome) would advise him not to expend his energies upon the invention of a digging implement to be worked by steam.

Mr. J. J. Meechi mentioned, as a proof that Fowler's method of ploughing was coming largely into use, that a contract was taken for ploughing 200 acres by this plan on a farm in Essex. This showed that it was in large practical operation, and he had no doubt that it would grow.

Mr. Newton, although not a practical agriculturist, could venture to differ from some of the views expressed by Mr. Ransome. He did not think ploughing—taking the plough in the form in which they were acquainted with it—could be beneficially carried out to any great extent in this country by means of traction power. Whether the implement was capable of modification so as to obviate the hard under surface occasioned by the sole of the plough, he could not say. Every agriculturist would admit that ploughing was not so beneficial an operation in the preparation of the land as hand labour with the spade, but this was so expensive as to be out of the question. He thought the application of traction by ropes to the plough involved great waste of power, and the friction of the rope on the ground occasioned an amount of wear and tear which formed a serious item of expense. Nor was that the only objection to ploughing by steam under the method adopted by Mr. Fowler. There must be great waste of time, especially in small fields of six or seven acres, in arranging the anchors and windlasses, and also in the lateral shifting in the headland. It was stated in the paper in some instances to occupy 25 per cent. of time throughout the whole of the day. That formed a serious item. If they

had large fields, such as were seen on the Continent, the case might be different, and in fields of 100 or 150 acres, Mr. Fowler's plan could probably be carried out with advantage. They must, however, take the case as it stood in this country. They could not remodel estates.

Mr. Meechi said this *must* be done.

Mr. Newton very much questioned whether the landlords as a body would allow their tenants to grub up the hedges, and cut down the trees, to form open lands on their farms. Reference had been made to Romaine's cultivator. That machine could be taken to any field where the gateway was wide enough to admit it, and every foot of the land could be cultivated by it, without any further operation being required, besides which it was capable of being adapted to all the purposes for which the portable steam engine was employed upon a farm. The cost of that machine was stated in the paper to be £700. It ought, however, to be borne in mind, that an implement of that kind dispensed with a considerable amount of horse power. He believed it was not generally known that the horse power for agricultural purposes in this country consumed from one-fifth to one-sixth of the whole produce of the land.

Mr. Meechi said, on small and moderately cultivated farms it would amount to one-fourth. On well cultivated lands it would be about one-fifth.

Mr. Newton added that such an item in the expenditure on a farm was very serious. He repeated his belief that the system introduced by Romaine would ultimately be found to be most successful in the cultivation of the land, from the fact that all the necessary operations were effected at once.

Mr. Meechi wished to explain that in stating the consumption of the horses on a farm to be, in some cases, one-fourth of the produce, he did not mean one-fourth in value, as of course horses were not fed upon wheat, but the produce arising from one-fourth of the extent of the farm.

Mr. JOHN FOWLER had listened with great interest to the able paper of Mr. Clarke, which he regarded as a most excellent *résumé* of what had been effected in steam culture up to the present period, and an extremely fair criticism upon the merits of each invention. With reference to the remarks of Mr. Newton, although he agreed with him in the belief that rotary cultivation in some shape or other would be ultimately brought to bear, yet they could hardly assume that it would do all that was required. It was possible that rotary cultivation might effect the overturning of the soil, and he believed there was no very great difficulty in bringing it to bear for that purpose on level and firm soils, but upon very uneven surfaces the power expended in taking the machine over them must be very great. Of course there were many improvements in detail which might be made in such a machine, and he should be glad to see the gentlemen agriculturists of England—for it was not the place of the tenant farmers to do it—appropriating a small portion of the income which they derived from the land to experiments in rotary cultivation. With regard to himself, he ventured to say that the system of ploughing he had introduced was a step in the right direction. He thought there could be no question that it was a really practical plan, inasmuch as it performed the ploughing at half the cost of horse-power, and the work was better done. He was happy to have the testimony of Mr. Meechi in its favour, though it was by no means the first he had had. Seven acres of sandy soil, in the neighbourhood of Ipswich, had been ploughed by steam, and the result was, even on land which had no rich subsoil to be turned up, that a yield of a quarter per acre more in the crop was obtained. The people in the neighbourhood suggested that the difference arose from the depth of the tillage having prevented the drought from attacking the wheat. He admitted the superiority of hand-spade c

tivation over even steam ploughing, but it was too expensive in practice, and he was prepared to say that, on heavy clay land, steam-cultivation, equal to spade-labour, could be done for 12s. an acre. With regard to the wear and tear of the rope under his system a misapprehension existed. Upon clay land, he would guarantee the wear of the rope at sixpence per acre; he believed it would not exceed 3d. per acre; but if the work was done upon gravelly soil, abounding with sharp flint stones, greater care was necessary with regard to the rope, although in such cases he believed the expense would not be greater; but if farmers used the rope in the careless manner they frequently did their steam-engines, of course they must be content to bear the expense of their negligence. Judging of what he had seen of rotary cultivators, he believed that they would occupy a prominent position in a few years, and no pains should be spared to bring this about. There was one point which bore materially upon steam cultivation. The moment they were prepared to do all the cultivation on a farm by means of machinery more advantageously than by horse-power, horses themselves would only be required for the carting, and would have to stand idle a large portion of the week. This showed the importance of bringing about a perfect system of steam traction. Mr. Boydeil had gone far to develop that. He (Mr. Fowler) believed that a smaller class of that description of engine—say of four-horse power—could be used for the work of a farm more economically than horses. He thought it ought to be fairly tried. Who was to try all those experiments? Were the inventors to bear the whole brunt of that which was in fact a national benefit? The landlords hitherto had done little. The Royal Agricultural Society had given no help. He could only state that the trial of his system at Salisbury was appointed to take place on a steep hill, resembling the roof of a house, and the decision arrived at was that the steam plough would not answer. Notwithstanding all this, he was prepared to prove that he could plough at half the cost of horse power. It was plain they would get no assistance from the public or from the landed proprietors, who would, after all, derive the greatest benefits in the improved rental of their estates. As far as steam ploughing was concerned, he considered his task was done; but it was for such men as Messrs. Romaine and Boydeil to carry their experiments further in another direction, and he was strongly of opinion that the public at large ought to help them in their work.

Mr. SMITH (of Woolston) avowed his determination not to receive any assistance from any society or any individual. He would state his reasons for not using the combined plough for the inversion of the soil. In January, 1856,* he stated before this Society what he had done in the way of steam tillage up to that period, and he would now state what he had done further since that period. He would not speak of his own plough, but would refer to the machinery employed for laying out the land and the mode in which he effected it, as upon that he considered the success of his system of tillage mainly depended. In the two experiments referred to by Mr. Clarke in his paper, one at Chelmsford and the other at Woolston, he (Mr. Smith) had not space enough to show properly how he set out his work. Mr. Smith proceeded to explain the details of his plan, particularly describing the mode of setting out his machinery and tackle. (This, however, would be unintelligible without the plans and sketches to which he referred.) Mr. Smith went on to remark, with reference to steam culture, that all farmers would admit that the first month after harvest was worth all the other months of the year put together. There were, in fact, only two months which were really valuable to the farmer for ploughing. Those were September and October. The engine which he recommended was the common 8-horse engine, but he

had found a 7-horse engine sufficient for all his work upon a farm of about 200 acres, 110 of which were arable, and the engine could do all the threshing, grain-cutting, &c. The tackle to be attached to it, as he contended, was paid for in the first year it was used. He had found in his own experience and that of his brother farmers, that a quarter acre more in the yield of the crops resulted from his system. Mr. Smith next proceeded to contrast the system of anchorage and rope traction adopted by Mr. Fowler with his own plan, and pointed out the great reduction he had made in the number of horses employed previously to the introduction of his system of steam-cultivation. In the first year he steam-ploughed a field twice over, and the yield was 41 bushels of wheat per acre; the succeeding crop was barley, and that of that was 7 quarters 1 bushel per acre, from land which formerly only gave a yield of 5 quarters per acre. On an average he employed his steam machinery in 39 days in the year, consuming 14½ tons of coal at a cost of £14 10s. The only additional cost was increased labour, for during that period he had about 10 men sixpence a day extra. Mr. Smith then read from Mr. Randell, of Chadbury, near Evesham, Bright of Teddesley, Mr. J. Whiting of Stoke Newington, and Mr. George Taylor of Montmorency, the successful working of Mr. Smith's system of cultivation, on land in their occupation, or under their management.

The CHAIRMAN regretted that the time had not allowed of closing this discussion, more especially as he saw several other inventors—amongst them Mr. B. from whom he had hoped to hear some observations on this highly important subject. They would, however, all agree that Mr. Clarke was entitled to their thanks for his able paper.

A vote of thanks was then passed to Mr. Clarke.

On the table was exhibited a clock case, lately carved in box wood, designed and executed by Mr. W. Perry, of North Audley-street. The design represented an oak tree with various flowers on the branches, and with wild flowers growing from the stream of water at its base.

The Secretary announced, that on Wednesday evening next, the 17th inst., a paper by Prof. Grace Calvert, "On Recent Scientific Discoveries as applied to Arts and Manufactures," would be read.

EXAMINATIONS.

Mr. J. C. Macready, one of the Honorary Secretaries of the Society of Arts, recently gave notice to the English Poets at the Town-hall, of The Poole and South-Western Herald states that a special object which this gentleman had in view was raising of funds in order to enable the Poole Institute to form classes in various branches of education in conjunction with other Institutions in this part of the country, to be conducted in accordance with the regulations and in connexion with the Society of Arts; and members to be admissible to the Society's Examinations for prizes and honorary certificates."

HANTS AND WILTS ADULT EDUCATION SOCIETY.

This Society, which is in Union with the Society of Arts, was established in 1853, and its objects are stated generally in the prospectus, are—1st, the establishment and assistance of Literary and Scientific Institutions, libraries, whether stationary or itinerant, reading-rooms, and evening schools; and 2ndly, the

* See Journal Vol. IV., p. 175.

ions must be made for the gratuity to the Secretary before the 14th day of March." That has been adopted of determining the gratuity, with a view to the assistance of localities, has been to allow 1s. for every hour he has attended 80 hours, 6d. for every hour above 80 hours but less than 90 hours the school has been open.

" Two hours are allowed for the annexed paper. T

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M. A. - Indian Women, with Explanatory Remarks

gratis. During the past year 55 purchased and added to the library. Mr. the Librarian, states that the number of use of the library during the year was 3875. A considerable advance on the preceding year. Subscribed to the Reading Room during the average number making use of the room was rather more than 19. Chess and been provided for the use of the members room. Mr. John Fordham, Secretary of Savings Bank, states that the number was 259, and the amount deposited £154 3s., each depositor being 11s. 6d. The amount was £56 0s. 3d. After the adoption of the election of officers took place, the Right Hon. Lord Althorpe being elected President. After votes of thanks, the meeting separated.

An interesting and instructive lecture at the Town-hall in connection with the Improvement Society, on Friday evening, the Rev. Dr. Fletcher, of Wimborne, illustrated by maps and diagrams; W. H. Esq., in the chair. There was a good attendance and every one seemed pleased. The musical Institution played some select pieces before the lecture.

OWNERS.—The fifth annual report of the Institution, presented to a general meeting of members, held on Monday, the 28th day of December, when Mr. Cantrell, president of the Institution, in the chair, congratulates the members on the prosperity and success of the Institution. At the close of the year, the number of members and the committee have admitted during the year five honorary life members, one honorary member, and fifty-five ordinary members, making a total of 187. Against this the committee have the withdrawal of thirty-one from various causes, so the number of members at this time is 156, showing an increase of 30 members during the year. During the year four lectures have been delivered gratuitously in connection with the institution, each of which was profitable to it. The following are the lectures: "Poetry and the Poets of Derbyshire," by T. Esq.; "The Pendulum;" 1st—as a gauge of Musical Time; 2nd—as a gauge of Musical time; proving the oblate sphericity of the earth; and determining (Foucault's experiment) the earth's rotation; by the Rev. J. Edwards; "Chemistry; metallic elements;" by the Rev. F. H. Brett; and "Roman, and English Comedy," by the Rev. J. Esq. The library comprised a large number of books which were valueless for the purposes of the Institution, and the committee authorised the librarian to dispose thereof such as were suitable, and dispose of the same. In consequence of this step, the library has been increased in number, but is more available and suitable than heretofore. 99 volumes of new books have been received through various sources and added to the library. The present number of volumes belonging to the Institution is 829; and during the year no less than 1,077 books have been exchanged. The committee continued evening school, established by their predecessors, and added to in the report for 1856, up to April last, under the superintendence of Mr. H. Marsden. It was then closed during the summer months, and re-opened early in October. The present number on the books as attending the classes is 88, and the average attendance is 18. The balance in the treasurer's hands is £21 10s. 7d. In consequence of the favourable results of the Festival of the year, the committee thought it desirable to hold one this year also. The president of the Institution again had the disposal of his grounds at the service of the committee, and a horticultural exhibition was held, which proved successful.

MEETINGS FOR THE ENSUING WEEK.

- Tues. Royal Inst., 3. Prof. Huxley, "On Animals and Plants compared physiologically."
Civil Engineers, 8. Mr. J. A. Longridge, M. Inst. C.E., and Mr. C. H. Brooks, "On Submerging Telegraphic Cables."
Pathological, 8.
Statistical, 8. Mr. Newmarch, "On the History of Prices in 1857."
- Wed. Society of Arts, 8. Prof. Grace Calvert, "On Recent Scientific Discoveries as applied to Arts and Manufactures."
- Thurs. Royal Inst., 3. Prof. Tyndall, "On Heat."
Philosophical Club, 5½.
Antiquaries, 8.
Chemical, 8. Mr. Mercer, "On Atomic Weights."
Linnæan, 8. I. Mr. Lubbock, "On the arrangement of the cutaneous muscles of the Larva of *Pygæa bucephala*."
II. Mr. Macdonald, "On the probable metamorphosis of *Pedicularia* and other genera of *Gastropoda*." III. Mr. Macdonald, "On the Anatomy of *Larybia*."
Philological, 8.
Royal, 8½.
FRI. Geological, 1. Anniversary.
Royal Inst., 8½. Mr. E. Beckett Denison, "On some of the Improvements in Locks since 1851."
- Sat. Asiatic, 2.
Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Delivered on December 14, 16, 18, 19, 21, 22, 23, 24, 26, 29, 31, 1857.
January 1, 5, 11, 12, 18, 29, and February 2, 1858.

- Parl. No.
5. Pauper Lunatics (Scotland)—Return.
7. Oxford University—Copies of Statutes and Ordinances.
10. Ecclesiastical Commission (Ireland)—Report and Account.
4. Banks—Return.
8. Articles of Food—Return.
13. Netley Hospital—Reports.
22. Land Transport Corps—Copy of Instructions.
12. Flogging (Navy)—Return.
17. Flogging (Army)—Return.
23. China (Military Auditor)—Copy of Instructions.
9. Charterhouse—Copy of Report.
14. Freight of Species—Return.
15. Public Parks—Return.
24. Common Law (Judicial Business)—Copy of a Letter.
16. East India (Revenue)—Return.
21. River Thames—Copy of Mr. Gurney's Report.
19. Australian Postal Service—Copy of Contract, &c.
20. Police (Counties and Boroughs)—Reports.
11. East India (Public Works)—Return.
2. Bills—Medical Charities (Ireland).
5. —Public Health Act (1848) Amendment.
Army Purchase Commission—Report of the Rt. Hon. Edward Elliot, &c.
Liverpool Compass Committee—First and Second Reports to the Board of Trade.
Galway Town Election—Report of Commissioners.
Colonial and other Possessions—Statistical Tables, Part 2.
Engineers' Wages and Park—Paper relative to the Imprisonment of, at Salerno.
East India (Despatch of Troops)—Correspondence.
Decimal Coinage Commissioners—Lord Clonbrooke's Questions, with Answers.
Trade and Navigation (1856)—Annual Statement.
Australia (Discovery of Gold)—Further Papers.
East Indies (Mutinies)—Appendix (A) to further Papers (No. 6).

FIRST SESSION, 1857.

125. General Index to Sessional Papers 1852—1857.

SECOND SESSION, 1857.

281. Public Income and Expenditure—Account.
329. Parliamentary Voters—Abstract of Return.
336. Accidents on Railways, &c. (Ireland)—Abstract of Return.
77 (A 3). Poor Rates and Pauperism—Return (A).
277. Lunatic Asylums (Ireland)—Report of Commissioners.
306. British Guiana—Return.
49 (7). Trade and Navigation Accounts (30th Nov., 1857).
224, 260 (1). Hudson's Bay Company—Plans referred to in the Report.
269 (1). Contracts (Public Departments)—Index to Report.
77 (A 4). Poor Rates and Pauperism—Return (A).
126. Civil Services, &c.—Detailed Statement of the Estimates.
262 (2). Hop Duties—Index to Report.
77 (A 5). Poor Rates and Pauperism—Return (A).
334. Convicts and Misdemeanants (Ireland)—Abstract of Return.
282. Railways—Return.

Delivered on 6th February, 1858.

26. National Gallery and British Museum—Return.
9. Bill—East India Loan.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 5, 1888.]

Dated 8th December, 1887.

3638. William Jones Ward, Chorlton-on-Medlock, Manchester—Improvements in dyeing and printing textile fabrics and materials, and in apparatus connected therewith.

Dated 15th January, 1888.

66. John Macintosh, Aberdeen—Improvements in apparatus for the manufacture of articles of confectionery.

Dated 19th January, 1888.

66. Vital De Tivoli, 67, Lower Thames-street—An improved omnibus.

Dated 20th January, 1888.

95. Robert Martin, Glasgow—Improvements in machinery or apparatus for effecting the shipping of minerals in tidal situations.

97. William Muir, Strangeways, Manchester—Improvements in stands for letter copying presses and other small machines.

99. John Dyson, Edwin Wilkinson Shirt, and Henry Shirt, Tinsley Works, near Sheffield—An improved construction of spring for resisting sudden and continuous pressure.

101. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preservation of animal and vegetable substances. (A communication.)

103. William Consobee, King-street, Queen-street, Southwark-bridge-road—Improvements in printing machines.

Dated 21st January, 1888.

106. James Henry Wheatley, 15, Jacob's Well, Barbican, City—Improvements in printing machines.

106. William White, Adelaide-street, South Shields—Improvements in machinery or apparatus for making moulds or matrices employed in casting metals.

107. Thomas Ivory, Edinburgh—Improvements in steam boilers.

109. James Murdoch, 7, Staple-inn—Improvements in breaks for railway and other carriages. (A communication.)

110. Peter Wilson, Samuel Northall, and Thomas James, Birmingham—Improvements in locks and latches.

111. Edward Bawlings, Birmingham, and John Briden, Aston-juxta-Birmingham—A new or improved method of working stamps used for stamping or raising metals, and other such like purposes.

112. Henry Smith, Brierley Hill Iron Works, Dudley—An improvement or improvements in the manufacture of iron hurdles and fencing.

113. John Stalide Brown, Cirencester—Improvements in mills for grinding corn or other substances.

114. William Clark, 63, Chancery-lane—Improvements in lubricating apparatus. (A communication.)

115. Hyacinthe Hermagis, Paris—Improvements in stereoscopes.

Dated 22nd January, 1888.

116. William Matthew Raine, 34, Bucklersbury—Purifying and increasing the illuminating power of gas.

117. William Blackett Haigh and Joseph Cheetham, Oldham—Improvements in valves for steam-engines and in super-heating the steam.

118. James Brown, Coventry—Certain improvements in looms.

119. James Brown, Coventry—Certain improvements in Jacquard machines.

120. William Basford, Longport, Staffordshire—Improvements in kilns or ovens for burning or firing bricks, tiles, pipes, and pottery or earthenware, and in the mode of charging the ovens or placing or setting the articles that are to be fired therein.

121. Alfred Berry, Gorwydd Colliery, Swansea—Improvements in safety lamps.

122. William Weld, Manchester—Improvements in machinery for winding yarn or thread on to bobbins, spools, cards, or other similar surfaces.

123. Thomas Walton Mellor, Ashton-under-Lyne—An improved apparatus for measuring water and other fluids.

Dated 23rd January, 1888.

124. Nicolas Augustin Drouot, and Pierre Philippe Le Coq, Paris—Improvements in treating chloride of sodium for obtaining therefrom certain useful products.

126. John Samwells, Dunstable, Bedfordshire, and Charles Henry Jones and Christopher Pickard, Leeds—Improvements in blocking and shaping hats, bonnets, and other coverings for the head.

127. John Gordon, 3, Railway-place, Fenchurch street—Improvements in machinery or apparatus for pulping coffee.

128. James Johnston, Paisley—Improvements in bonnets, caps, and other coverings for the head.

129. Charles Burn, Blomfield-crescent, Westbourne-terrace, Nottingham—Improvements in the manufacture of trunks and chains, which improvements are applicable to the manufacture of gold and other chains.

130. Jonas Craven, Bradford, and Wignall Hey and Charles Watson, Nottingham, near Bradford—Improvements in constructing rotary shuttle boxes of looms.

131. Elijah Black, Glasgow—Improvements in the treatment or preservation of potatoes and other amyaceous vegetable substances.

132. Joseph James Welch and John Stewart Marples, Cardiff—An improved expanding or folding travelling bag or case.

133. Jean Jacques Huber, 14, Boulevard Montmartre, Paris—Improvements in the construction of brooches, bracelets, and other articles of jewelry.

Dated 25th January, 1888.

134. Arthur Wall, East India road, Poplar—An improved motor for the moving parts of machinery.

135. George Edward Dering, Lockleys, Hertfordshire—Improvements in the permanent way of railways.

Dated 26th January, 1888.

136. Jeremiah Garrett, Culey, and Peter Garrett, jun., Clifton, Yorkshire—Improvements in the manufacture of cast-iron.

138. Sir Henry Stracey, Bart., Blackheath-hall, North—An improved carriage.

140. William Edward Newton, 66, Chancery-lane—A new or improved fabric intended principally as a substitute for silk. (A communication.)

142. Luigi Ferrari Corbelli, Florence, Tuscany—A new or improved process for obtaining aluminium. (Partly a communication.)

Dated 27th January, 1888.

146. Thomas Mottram, John Edwards, and Joseph Miskell, Walsby, Yorkshire—Rolling steel, iron, and other metals, and also tilting the same for outlery and other purposes.

WEEKLY LIST OF PATENTS SEALED.

February 5th.

2123. Daniel Jones Crossley.

2124. Ellis Rowland.

2127. John Parker.

2132. Thomas George Shaw.

2140. John Roberts, jun.

2157. Robert McAdam.

2180. John Abraham.

2235. François Jules Blanc.

2287. Lionel Gisborne and Henry Charles Ford.

2481. John Chubb.

2664. Athanasios Victor Constant Regnaud.

2728. Johan Ernst Fridrich Luedke.

2887. Alfred Vincent Newton.

2896. Philip Bettle.

2911. John Cope.

2984. Richard Hipkiss and William Olsen.

2987. Edward Clarence Shepard.

2996. Alexander Parkes and H. Parkes.

3103. James Broad.

February 9th.

2139. James Bertram and John Louis Jullion.

2143. Amherst Hawker Beaton.

2144. Peter Augustin Godefroy.

2146. George Chambers.

2150. Thomas Hardman.

2151. Robert Wagnat.

2152. Robert Wagnat.

2153. William James Cuthbert.

2170. Samuel Cline.

2177. John Baskley and Thomas Wrigley.

2197. Arthur Wall.

2198. Arthur Wall.

2286. William Hartig.

2263. James Goodwin and Andrew Boyd.

2271. Robert Aytoun.

2276. George Cumming.

2281. George Bell.

2326. William Edward Hall.

2333. William Sellar.

2394. Thomas Siddons.

2413. Hugh Greaves.

2443. Pierre François Joly.

2486. Richard Watson.

2619. James Ward.

2737. William Clark.

2761. John Lawson.

2876. Thomas Richardson.

2893. Adolphe Ambroise de la Motte-Cohen.

2491. Augustus Frederick.

2946. Robert Tindall, jun.

3073. Joseph Parker.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

February 1st.

288. Edmund Clegg and James Leach.

February 3rd.

263. Godfrey Pattison.

February 4th.

265. John Henry Johnson.

266. William Warbrick and J. Walker.

320. Auguste Edward Bellford.

301. George Ferguson and George Payne.

316. George Hallen and Henry Richard Cull.

302. Frederick Ramsay.

331. Auguste Valley.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4061	Feb. 4.	Improved Configuration of a Drum	Budall, Rose, Carte and Co.....	30, Charing-cross.
4062	" 6.	The Paragon Shirt.....	H. F. Lawes.....	Bristol.
4063	" 8.	Royal Princess Corset Fastener	The Edinburgh Machine Sewing Company	Edinburgh.
4064	" 8.	Churn Driving Apparatus and Stand	Thewlis and Griffith.....	Warrington.
4065	" 8.	{ An Improved Piston for Valved Musi- cal Instruments	Joseph Pimlott Oates.....	Erdington.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 19, 1858.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.
2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to Society's House, Adelphi, London, W.O., *in time paid*.

The days for receiving articles are, Thursday, 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief clear description of the invention, with a sketch (when possible) for illustrating the nature, and a reference to any publication in which the Invention is described. The drawings exhibited must be framed.

SPECIAL PRIZE.

Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the late Trench and J. MacGregor, Esq.,) and the Silver Medal, is offered for a Writing-Book for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following conditions, which will influence the Council in their award:—

- 1. The book must be of size, and of good workmanship (if possible) of fluid ink, and of good quality.
- 2. The book must be supplied with a guaranteed supply, and be applicable to the duties, habits, and requirements of the above classes.

Articles sent in for competition must be sent to the Society's House, Adelphi, W.O., on or before the 8th May next.

NATION PRIZE FUND FOR 1858.

Following additions have been made since last announcement:—

Ames	£5	5
William Hawksworth	1	1
James Holmes	1	1
William T. Radford	1	1

COMMITTEE ON THE PATENT LAWS.

The Council have re-appointed the Patent Law Committee of 1856, and the following gentlemen, who formed the Committee at that time, have been requested to serve again:—

W. Bridges Adams. John George Appold, F.R.S. W. G. Armstrong, F.R.S. Samuel Holden Blackwell. J. M. Blashfield. John Braithwaite. Jacob Brett. Joseph Burch. F. Crace Calvert. Dugald Campbell. Robert Lucas Chance. Edwin Clark. Henry Cole, C.B. Charles Cowan, M.P. Frank Crossley, M.P. Thomas De la Rue. Bryan Donkin. William Ewart, M.P. William Fairbairn, F.R.S. Robert Fletcher. Benjamin Fothergill. Sir Charles Fox. Dr. J. H. Gilbert. Joseph Glynn, F.R.S. Prof. Graham, F.R.S. Peter Graham. Warren S. Hale. Henry Henaman. John Hick. Edward Highton. A. C. Hobbs. S. C. Homersham. A. H. Houldsworth.	William Hutt, M.P. Capt. L. L. Boscawen Ibbetson, F.R.S. Owen Jones. John Bennet Lawes, F.R.S. George Lowe, F.R.S. Sir John Macneill, F.R.S. Henry Maudslay. Charles May. Henry Medlock. J. E. McConnell. John Joseph Mechi. Herbert Minton. Robert S. Newall. Thomas Page. Sir Joseph Paxton, M.P. John Penn. Ainger M. Perkins. Richard Roberts. Titus Salt. Charles W. Siemens. Lord Stanley, M.P. Robert Stephenson, M.P., F.R.S. Colonel Sykes, F.R.S. J. P. Brown Westhead. Prof. Wheatstone, F.R.S. Joseph Whitworth. George Fergusson Wilson, F.R.S. Edward Woods. Matthew Digby Wyatt. T. H. Wyatt.
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SOULAGES COLLECTION.

The Council have appointed a Deputation to join with the Institute of British Architects, and wait upon Lord Palmerston and the Chancellor of the Exchequer, to urge upon the Government the propriety of securing the Soulages Collection for Public Instruction. The Members named as the Deputation are the following:—

Beriah Botfield, M.P. Dominic Colnaghi. William Cubitt, M.P. Warren De la Rue, F.R.S. Henry Drummond, M.P. William Ewart, M.P. Viscount Goderich, M.P. George Godwin, F.R.S. F. Seymour Haden. Henry Thomas Hope. Owen Jones. Joseph Locke, M.P. George Moffat, M.P. J. A. Nicholay.	Sir John Pakington, Bart., M.P. Sir Joseph Paxton, M.P. William Roupell, M.P. Sydney Smirke. J. Jobson Smith. Lord Stanley, M.P. William Tite, M.P. Matthew Uzelli. John Webb. James Whatman, M.P. Thomas Winkworth. M. Digby Wyatt.
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Together with the Presidents of Institutions in the manufacturing districts.

EXAMINATIONS.

The following letters relating to the Examinations are published, with notes of the replies:—

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could have been produced so free from them, as I think this will prove to be, so simple in its machinery, so calculated to suit all the numerous and various uses to which it is intended to be applied.

Of course, the standard and subjects of the examinations will scarcely be what each Institute would have, and they will doubtless be varied as experience suggests; but, in the present circumstances, they are the best arrangements which, in my opinion, could be made. The Society richly deserves the best of the Institutes for its labours in this matter.

I would state that Dr. Hume, your Honorary Local Secretary for Liverpool, lately delivered a very able, interesting, and encouraging address to our students, in accordance with the plan of Examinations. It was given at the annual meeting; and an abstract of it, if not the whole, will be printed with our annual report, a copy of which will shortly send to you.

I am, &c.,

ASTRUP CARISS, Secretary.

Perre Foster, Esq.

Mechanics' Institute, Louth, 4th Feb., 1888.

SIR,—The committee have appointed five of the members the Local Board of Examiners for the Examinations. It would be impossible to select others more qualified for the office than those they have selected. Two of them are principal educational establishments, one is a barrister, a surgeon, and the other is the President of the Institution, a Dissenting Minister; both of the latter distinguished by their great scientific attainments. I have published a small handbill, in order to make the examinations generally known, a copy of which I send you.

It is good enough to send me five copies of the programme for the Local Board.—I am, &c.,

B. CROW, Hon. Sec.

Perre Foster, Esq.

Mechanics' Institute, Northwram, Halifax, Feb. 11, 1888.

SIR,—I am duly in receipt of your circular letter of the 10th instant, and brought the subject of the same, together with your letter, before the meeting of the directors of this Institution last

night. We are able to present for examination by the Examiners, at least, one member of this Institution, who will be willing to undergo an examination in arithmetic, algebra, mensuration, and bookkeeping. The Institution lies at a distance from any other one, and the directors are of opinion that there are gentlemen in the neighbourhood competent to undertake the duties of Examiners, they have decided to form a Local Board to consist of the following gentlemen:—Mr. J. H. Moore, Esq., The Rev. W. H. Wawn, M. A., Mr. J. H. Washington; and I shall be happy to make the arrangements are made, to form the means of communication between these gentlemen and yourself. The examination will be prepared to conduct the previous examination in Easter week, and to superintend the examinations during Whitsuntide. In the meantime I feel obliged if you will keep them in the proceedings of the Council in reference to the examinations, and will be grateful for any suggestion which you may favour them.

Geography (12) been recently added to the list of the candidates are to undergo a previous examination. Is it not a subject in which much opinion may exist as to what will be the standard for a candidate to pass?

Will it be a favour if you would give me your opinion as to what is intended to be the nature of the examination in this subject.—I am, &c.,

JOHN W. WOOD, Hon. Sec.

Perre Foster, Esq., Society of Arts.

Gibson-street, Newcastle-on-Tyne, Jan. 15, 1888.

SIR,—In reply to your queries of the 4th January, I have to state, in reference thereto, 1. At Newcastle, as the most central place in the four northern counties.

2. I do not think you can, because there are very few classes connected with the Institutions. Classes are generally conducted by private teachers as night schools.

3. I do not think you can. The Societies in the North are not educational so far as classes are concerned, nor have they any accommodation for making them so. The returns to us from 55 Institutions, show that there were only 16 classes, and the total number of pupils entered 263, and the attendance of these not satisfactory. The classes best attended are French and German, because, in seaport towns, a knowledge of these languages is necessary to procure situations of trust in merchants' offices, and then the persons who attend these classes are not mechanics or the working classes.

The classes in the North of England Societies are not in a satisfactory condition, and where they do exist they are by no means in a flourishing state, and hence I imagine that you can be of little use.

I am, &c.,

J. D. THORNTON, Hon. Sec. Northern Association of Literary and Mechanics' Institutions.

Mayrick-street, Pembroke Dock, 11th Feb., 1888.

SIR,—Having been appointed a member of the Local Board of Examiners for this Institute, I am requested by my colleagues to make some inquiries for our guidance. It is stated that the previous examination shall take place twelve weeks before Whitsuntide. Cannot this requirement be a little relaxed? (13) In the letter received by the Secretary of the Institute this week, geography is named as one of the preliminary subjects, although it is not named as one in the programme. (14) It is also stated in that letter that the previous Examination is to be partly *visà voce*. Is that necessary, or is it optional? (15) The most important points, however, are the nature of the questions to be set—the amount of difficulty they should involve—the mode of determining the value of the solutions (16) and the standard to be reached in order to secure a "pass."

We shall be most happy to receive all the information you can give us on these points. In my own opinion the nature of the questions, the marks awarded, and the standard to be reached should, if possible, be uniform throughout the country.

In the next place we require to be informed to what extent the *special subjects* (17) should be examined in at the previous Examination?

Candidates are also asking such questions as these:—May they take one special subject; or must they take three? Is Mathematics considered as one special subject, or is each subdivision a special subject? If Mathematics be regarded as one subject, must all the subdivisions be taken up? May they take up Roman History without the Latin Language? (18)

Be so kind as to reply to the above as early as convenient, and to give us any other information likely to be useful.

Can you also supply us with a few copies of the programme for the use of the Examiners, and also for distribution?

I am, &c.,

JOHN T. COCK.

P. Le Neve Foster, Esq.

Pembroke Dock Mechanics' Institute, 11th Feb., 1888.

SIR,—We have chosen three persons as Examiners, two of them being schoolmasters; there are several members who have expressed themselves desirous of undergoing an examination, but there are a few questions I am desired to ask.

It is stated in the programme or pamphlet we have received that a person will not be examined in more than three subjects. Can he take up less?

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12. See note 14.

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13. See note 9.

14. Geography is a special subject in the Programme. In the previous examination in geography is required in those cases alone in which the candidate takes up geography as a special subject.

15. The previous Examination must obviously be held in "reading," and written in "writing." Beyond these all is left to the discretion of the Local Boards. They may use written or oral tests in any proportion as they judge best.

16. The Council do not wish to prescribe uniform and positive rules on these points. Any inequalities in the value of the "passes" can best be corrected when the Examinations have been held, or when it has been seen what the different Boards have done, and with what results. The Council, however, will be most happy to give at any time any advice or explanations which any Local Board or individual member of it may desire.

17. All that is necessary is that the Local Board should satisfy itself that the candidate has a fair knowledge of the special subject. The Local Board, at the previous Examination, need not exactly gauge the attainments of the candidates. It is, however, desirable that this should be done wherever it is possible. It is desirable that the Local Boards should have a real substantive character; should pass definite judgments on their candidates, and award certificates and prizes. It is desired that they should have a real authority of their own, and should rather co-operate as substantive bodies with the Society of Arts than merely as accessaries to the Central Board.

18. Candidates may be examined at the previous Examination in any subjects, and to any extent, that the Local Boards may determine. Candidates may be examined at the Final Examinations in any of the subdivisions of any one, two, or three of the twelve principal subjects of the programme. In Mathematics there are eight separately specified subdivisions of the principal subject. Candidates may take up the whole, or any subdivision, of any three subjects. Candidates may take up Roman History with or without Latin.

19. If the Local Boards generally should desire the Council to furnish them with printed papers for the previous Examinations, the Council will be happy to do so next year.

ELEVENTH ORDINARY MEETING.

WEDNESDAY, FEB. 17, 1858.

The Eleventh Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 17th inst., William Odling, Esq., M.D., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Abernethy, James	Fleming, Thomas
Cawley, Charles Edward	Howard, James
Figgins, James, jun.	Ripley, Henry William
	Spencer, John Frederick.

The Paper read was:—

ON RECENT SCIENTIFIC DISCOVERIES AS APPLIED TO ARTS AND MANUFACTURES.

By MR. CRACE CALVERT.

ON COLOUR OBTAINED FROM COAL TAR PRODUCTS.

When, in November 1854, I had the honour to read before this Society a paper on the products obtained from coal, I stated that ere long, besides carbo-azotic acid, some valuable dyeing substances would be prepared from this mineral. This expectation has been fulfilled.

Messrs. W. Perkins and A. H. Church have obtained several blue colouring substances from the alkaloids of coal tar, and one from naphthaline, named by them Nitroso-phenylene and Nitroso-naphthylene, &c.

Mr. Perkins has lately taken a patent for the commercial application of some of these beautiful purple blue colours, which he has succeeded in fixing on silk, a sample of which I have the pleasure to lay before you. This fine colour, which rivals the delicate and admired colour of orchil, has this great advantage over it, that it is not destroyed by light; Mr. Perkins has, therefore, solved one of the problems of the art of dyeing, viz., the production of a fast colour similar to the fugitive one of orchil. Mr. Perkins's process consists in dissolving in water the sulphates of aniline, of cumidine, and of toluidine, and adding a quantity of bicromate of potash sufficient to neutralize the sulphuric acid in these sulphates. The whole is left to stand for twelve hours, when a brown substance is precipitated, which is washed with coal tar naphtha, and then dissolved in methylated spirits. This solution, with the addition of a little tartaric or oxalic acid, forms the dyeing liquor of Mr. Perkins.

Mr. Charles Lowe and myself have lately been fortunate enough to obtain from coal tar, products having a most extraordinary dyeing power, and yielding colours nearly as beautiful as safflower pinks and cochineal crimson; and what increases the interest of this coal tar product is, that by the process we have discovered, we can obtain with it, on a piece of calico mordanted for madder colours, all the various colours and shades given by this valuable root—violet, purple, chocolate, pink, and red. The only thing which has prevented us from introducing into the market the crown red inodorous paper which we prepare, has been, that it is as yet too expensive to compete with this extraordinary colour-giving root, but we intend pursuing our researches in the hope of employing it as a substitute for safflower or cochineal, two colouring matters, the price of which is sufficiently high to induce us to continue our investigations. We may add, that our imitation of safflower colour stands soap and light, whilst safflower colours do not.

I shall now draw the attention of the meeting to the preparation, dyeing, and printing of a magnificent crimson colour, called murexide, obtained from guano, a substance which, until lately, has been entirely imported for agricultural purposes. The interesting application of this colour to calico-printing has been, like many valuable chemical discoveries, progressive, and has only been brought to successful commercial application by successive discoveries, made by various persons.

Prout was the first chemist to remark that if the fæces of serpents were heated with nitric acid, and a little ammonia added, a beautiful purple colour was produced. He named it purpurate of ammonia. This substance, when dry, has the appearance of a dark-red powder, soluble in water, to which it communicates a magnificent red colour. This solution not only gives a precipitate with metallic salts, but when evaporated yields beautiful crystals, having the iridescent appearance of the wings of cantharides.

This discovery has also been useful to medical men, by enabling them to distinguish the uric acid calculi.

Messrs. Liebig and Wöhler had also investigated the subject, and succeeded in obtaining from the uric acid contained in the fæces of serpents this substance, which they called murexide, and a new class of organic substances, the knowledge of which has much facilitated the application of murexide to dyeing and printing. Mr. Saeco was the first to apply the products of uric acid to the dyeing of fabrics; his process consisted in dipping woollen fabrics, prepared with a salt of tin, into a weak solution of alloxan, a product discovered by Liebig and Wöhler, in heating urea with nitric acid. The fabric so prepared was dried, and when submitted to heat a fine crimson was generated, the intensity of which was increased by the fumes of ammonia. But owing to

difficulty of obtaining a colour of uniform shade, Mr. Saac's process required improvements, and these have been effected by Mr. Schlumberger.

The process followed by Messrs. Saac and Schlumberger, could not be applied to silk or cotton fabrics. The method of dyeing silk with murexide was discovered by M. de Pouilly, who adopted the following processes, viz., dipping the silk in a concentrated solution of bichloride of mercury mixed with murexide, squeezing the silk well and hanging it in the air, when a magnificent crimson insoluble compound is fixed on the silk. This effect is produced from the fact that when solutions of bichloride of mercury and murexide are mixed together, an insoluble compound is only formed after the lapse of an hour or two.

The process for dyeing cotton is due to Messrs. Lauth and Schlumberger, and consists in producing on cotton a purpuration of lead by mordanting with nitrate of lead, passing into an alkali, and then dyeing in a solution of murexide; in order to give full brilliancy to the colour, it is lastly passed through a weak solution of bichloride of mercury. This process was further improved by Messrs. Dolfus, Meig and Co., in France, and Mr. Lightfoot, in Lancashire, by printing murexide with an excess of nitrate of lead, and subjecting the cloth so printed to the action of ammoniacal fumes, or passing it through a solution of caustic soda mixed with sal ammoniac. In order to render this substance more generally useful, it remained to find a method for obtaining fast colours with it on mixed fabrics, such as mousseline de laine, and this has also been effected by Mr. Schlumberger. The cloth is first prepared by uniting binocide of tin with the wool. This object is attained by using a salt known to calico printers as pink salt, the double chloride of ammonium and tin, and then printing on the prepared fabric the following mixture:—

- 1 part of murexide.
- 6 parts of nitrate of lead.
- 2 parts of nitrate of soda.

The pieces are then allowed to age for two or three days, when, to fix the purpuration of lead on the cotton, and the purpuration of ammonia on the wool, it is necessary to pass the cloth into a bath of bichloride of mercury, composed as follows:—

Water.....	100 gallons
Bichloride of Mercury	6 pounds.
Acetate of Soda	12 pounds.
Acetic Acid	2 quarts.

Until recently, all the green colours produced on fabrics were the results of blue and yellow mixed together; but of late public attention has been drawn to a green matter discovered by the Chinese, and fixed by them on cotton. It has been ascertained that they prepare it, by a long and tedious process, from two plants called Pa-bi-lo-za (*Rhamnus chlorophorus*) and Hom-bi-lo-za (*Rhamnus utilis*), and sell it in small square cakes, under the name of Luh-kaou or Luh-chao. The first commercial importation of this colour, new to us, is quite recent, as the first public sale of it in England took place a week ago, at the quarterly indigo sales, under the name of China green indigo. No sooner had a foreign green substance been brought to our notice, than in Europe we had succeeded in obtaining also a green dyeing substance from the plants which surround us, and Mr. Schlumberger has been fortunate enough to fix on woollen fabrics the green chlorophylle, or colouring matter of leaves and grass. This discovery will, in time, prove of great service to dyers and calico printers. Mr. Schlumberger's process consists in boiling 60 lbs. of grass with 25 gallons of water. This operation is repeated, and the grass then treated with 25 gallons of soda lye, with addition of 2 to 4 lbs. of Mercer's dung substitute (phosphate of soda and lime). Boil half

1 then add excess of hydrochloric acid; a ste falls, which is separated by filtration. to is dissolved in very dilute soda lye, ad-

ding a little of the substitute, and the silk or wool to dyed is dipped in until the desired shade is obtained. Stannate of Soda is the only mordant which gives a beneficial result.

M. Pelouze has rendered lately a great service Turkey red dyers by enabling them to use any oil, instead of only Gallipoli oil, and this of special quality. Pelouze has discovered that the difference there is betwixt a Gallipoli oil, which could be employed to advantage to produce a Turkey red on cotton, and which could not, was, that the first contained a large proportion of free fatty acids, whilst the latter was neutral. This led Mr. Pelouze first to prepare, specially, oils of good quality for Turkey red by mixing oleic acid with neutral oils; and, secondly, to the interesting scientific observation that oils were susceptible of undergoing a spontaneous fermentation as well as saccharine juices, or other organic fluids. Thus, immediately the neutral fatty matters in the cells of fruit roots are brought in contact with the ferment which vegetable substances contain, by breaking the cell which the fatty matters are deposited, the oil enters fermentation, and the fatty acids are liberated from glycerine with which they had been combined. This discovery gives us an insight into the acidity of some and the rancidness of others.

PATENT GUM.

One of my late assistants, Mr. Edward Hunt, has patented a discovery of much value to several trades especially to calico printers, who employ large quantities of various preparations of farina, sago, wheat, starch, flour, as a substitute for gum arabic, to thicken the dyes and steam colours. We shall better appreciate the value of the discovery made by Mr. Hunt, who reflect that hundreds of tons of the above preparations are employed annually, and that most of the substances used are articles of food, for by this discovery a saving in quantity is effected, two pounds of Mr. H. gum thickening as well as three pounds of ordinary calcined farina. This new gum presents also the following advantages, viz., being nearly white, perfectly soluble in cold water, and this solution not being so thick as the ordinary gum. The patent gum is manufactured by adding to 60 gallons of dry farina 60 gallons of buttermilk, and calcining the whole in the ordinary way. Strange to say, the lactic acid on the caseine and albumen of the buttermilk, is such as to render them, as well as the farina, soluble in water.

SULPHUROUS ACID.

The application of this acid to manufactures has been much impeded by the difficulty which the preparation of its solution presents on a large scale; for the production of sulphurous acid, as given in books, is always tedious, especially when its solution has to be prepared in large quantities. This difficulty I have overcome by a process which I here give to the public, and which enables me to prepare thousands of gallons per day of a saturated solution. The process consists in burning sulphur in a small furnace, and conducting the gas through earthenware tubes, surrounded with water, to cool them. It is then made to ascend through a column, 40 feet high and about 4 feet wide, filled with pumice stone which has been previously washed with dilute sulphuric acid and then with water. Whilst the acid gas is passing through the porous pumice stone, it meets a certain known quantity of water descending, which dissolves the acid; by opening, more or less, a valve at the top of the column, a more or less rapid current is established. With a little care, a saturated solution runs out constantly from the bottom of the column into a convenient reservoir, in which it is stored for use until required.

REFINING OF SUGAR.

I was led to apply the above process, from a visit to a sugar refinery, where I was convinced that a sulphurous acid in sugar-refining, convinced that it would be far superior to the sulphite of lime.

so strongly recommended, a few years ago, by Dumas and Melens, because that by its volatility it did not remain in the syrups or molasses, and give as the sulphite does, a disagreeable taste, in consequence of the lime of the sulphite remaining in the syrups as acetate and lactate. These anticipations were only realised, but I also found that sulphurous acid possesses two advantages for the sugar-refiner. 1st. It stops the fermentation of his hot liquors as they come out of the char-filters; and 2ndly, when properly used, it tends to prevent the re-colouration of the liquor during their concentration in the vacuum pan. In practice, I found that very successful results were obtained by adding two gallons of a saturated solution of sulphurous acid to every 100 gallons of decolourised syrup, it left the char-filter, and was collected in tanks, pumped up or run into the vacuum pan. M. Basset called the attention of the French Academy to a process which, he states, offers decided advantages. It consists in adding a solution of soap to the molasses or sugar in the blowing-up pans. The strong chemical action ensues. The fatty acids of the soap unite with the lime, which always exists in those sugar solutions even when lime has not been added by the refiner; and stearate of lime, as it falls, carries with it some of the colouring matters, thus facilitating the decolouration by the char. The alkali of the syrup remains united with the acids which were previously combined with the lime.

DISEASED BEERS.

Several brewers of late have suffered by their beer becoming rapidly sour after it was barrelled, owing to an imperfect fermentation succeeding an alcoholic one. I was led to as to the best means of preventing this acidification, and the process recommended by me is simple and practical. It consists in the employment

of sulphurous acid in solution or as a gas. But I found that mere sulphurization of the casks did not suffice. To ensure perfect success, it is necessary to soak well the fermenting vats and barrels, and also to thoroughly wash the coolers with a solution of sulphurous acid, in fact, all the various vessels used in a brewery should be treated by this antiseptic before satisfactory results are obtained.

ON THE PUDDLING OF IRON.

Great numbers of patents have been taken out to effect improvements in puddling, either by modifying the form of the furnace, or by employing various chemical mixtures, and several of these investigations have led to the discovery of the manufacture of puddled steel by Captain Uchatius, Mr. R. Mushet, and Mr. E. Riepe. Whilst reading the interesting paper of Mr. W. Clay, which he communicated to this Society on the 15th of January, it occurred to me that some improvements could be effected in Mr. Riepe's process, as well as in some of the others, if attention was drawn to some results published by Mr. R. Johnson and myself on the chemical changes which pig iron undergoes during its conversion into wrought iron, for it will be observed in looking over the following table (which contains a *résumé* of our results) that it is unnecessary to add various mixtures to melted pig iron during its conversion into wrought iron to stop its complete conversion, and to produce puddled steel. If mixtures of various kinds of iron have been employed, or chemical mixtures added, it is because no one had undertaken the long and tedious analysis of the various chemical changes which pig iron undergoes during its melting, boiling, and granulation in the puddling furnace. To have an insight into the phenomena, we took samples from the melted mass contained in the furnace at every well-characterised stage of the operations, and these are the results of our investigations.

of Sample.	Time when taken.	Stage of the Operation.	Appearance of the Sample.	Carbon.	Silicium.
Pig-iron used	12.0		Grey No. 3, cold blast Staffordshire	2.275	2.720
	12.40	Just after melting	White and brittle, like refined metal	2.726	0.915
	1.0	Perfectly fluid	Same as last	2.905	0.197
	1.5	Just on the boil	Black mass, composed of very small brittle granules	2.444	0.194
	1.20	Full boil	Black swollen mass, composed of very small brittle granules	2.305	0.182
	1.35	Just after boil	Black mass composed of rather larger granules, which are slightly malleable	1.647	0.183
	1.40	After the boil	Black mass, composed of much larger malleable granules	1.206	0.183
	1.45	Globules welding together	Black mass, large malleable globules	0.983	0.183
	1.50	Part of ball	Same as above, but the mass more compact	0.772	0.168
		Puddled bar	Good quality	0.300	0.120
		Wire	Good quality	0.111	0.068

COMPOSITION OF THE IRON USED.

Carbon	2.275
Silicium	2.720
Phosphorus	0.645
Sulphur	0.301
Manganese and aluminium	traces
Iron	94.059
	100.000

COMPOSITION OF THE SCORIA OR SLAG.

Silica	16.53
Protoxide of iron	66.23
Sulphuret of iron	6.80
Phosphoric acid	3.80
Protoxide of manganese	4.90
Alumina	1.04
Lime	0.70
	100.00

Without entering here into the chemical details of analysis, &c., I think it my duty to draw attention to several facts which the above results illustrate, viz., that the silicium in the cast-iron is oxidized during the softening and smelting of the pig iron, whilst the carbon remains stationary, or even increases, and that it is only after the boil that this substance is really removed from the iron. It is curious to observe that the cast-iron should remain in the furnace one hour, and in a fluid state for above 20 minutes, without losing more than a trace of carbon, whilst in the 20 minutes which follow (from 1.20 to 1.40), the cast-iron loses 50 per cent. of the carbon it contains, and if the partially melted mass now in the furnace were taken out, squeezed and rolled out, I have little doubt that it would be found to be puddled steel, for it would contain about the right proportion of carbon, viz., one per cent. Lastly, I would remark that the purpose of the early formation of the scoria, or

is to preserve the iron from a too rapid oxidation, and give time to the carbon to separate from the iron during the phenomenon of the boil, when ultimately it is consumed, as seen in the above table. The scoria or slag contains nearly the whole of the silicium, sulphur, and phosphorus existing in the pig iron.

I believe it will be useful to some members of this Society to be made acquainted with the composition of a mixture for welding iron and steel together, published by Mr. Rush. It is well known that the welding of these substances is not only difficult, but requires much skill from the workman who performs it. The process now followed consists in heating to a proper temperature the pieces of iron or steel to be welded, and then adding sand or a little borax on the surfaces, which, by dissolving the oxides of iron, renders the metallic surfaces clean and susceptible of welding. A Swiss workman some time ago found out, and used, with great advantage, a mixture for the above purposes, at the steel works of Durkheim, and Mr. Rust found this mixture to be composed of—

Borax	61-00
Sal ammoniac	17-25
Ferrocyanide of potassium	16-75
Rosin	5-00
	100-00

This composition being rather expensive, Mr. Rust was induced to make a series of experiments on this subject, and he succeeded in finding a cheaper and more effective mixture, which is composed of

Boracic acid	35-6
Common salt	30-1
Ferrocyanide of potassium	26-7
Rosin	7-6
	100-0

To weld steel with steel, he recommends the following proportions:—

Boracic acid	41-5
Calcined common salt	35-0
Ferrocyanide of potassium	15-5
Anhydrous carbonate of soda	6-0
	100-0

Mr. Charles Lowe and myself, have lately found out a new method of stiffening fustian and other goods, which presents the following advantages over the old process, viz., that whilst it satisfies all commercial requirements, it is free from that noxious and offensive smell so well-known to all who have had to deal with fustians and other goods stiffened with putrid bone size. It consists in the employment of a mixture of vegetable substances. It is little liable to mildew. This process is now being extensively carried on by Messrs. Joshua Scholfield and Sons, of Manchester.

I cannot refrain from mentioning some valuable results, published by Professor William Thompson, of Glasgow, on the relative conducting power of various samples of copper wire from different manufacturers, and it will be seen by the following table that wires of the same diameter varied as much as 50 per cent. according to the quality of the metal of which they had been made. Professor Thompson, knowing how important it would be to Electric Telegraph Companies to ascertain the cause of this variation in conducting power, made a series of experiments by which he found that fractional quantities of various metals, added to copper, modified in a remarkable manner its conducting power, as shown in this table.

CONDUCTIBILITY OF COPPER WIRE.

Test sample	100
Later samples (A) single wire.....	51-5
" " (A) strand.....	47-4
Laat samples (A) single wire.....	43
" " (B) single wire.....	35
" " (B) strand.....	30-7
" " (C) single wire.....	34-3
Two other manufactories:—	
(E) {	38
" {	71-4
(F) {	37
" {	36
Common copper wires (purchased in Glasgow)	49-1
	39-5
	35
Silk covered wire (from Manchester).....	38

SPECIMENS PREPARED BY MESSRS. MATTHEY AND JOHNSON.

Pure copper	100
Alloy of ditto, with 0-25 per cent. silver	100-4
" " 0-13 " "	100
" " 0-25 " lead	100-4
" " 0-13 " "	100-4
" " 0-25 " tin	99-4
" " 0-13 " "	100-4
" " 0-80 " zinc	99
" " 0-40 " "	95
" " 1-40 " "	74-4

In conclusion, allow me to draw your attention to the importance of establishing, in this country, a school or college for teaching chemistry as applied to the Arts and Manufactures. Nothing would tend more powerfully to benefit the commercial and manufacturing interests of the country than such an establishment, and I cannot but feel that there is no body of men in England so able effectively to promote this object, and to devise the best means of carrying it out, as this most useful and noble Society.

DISCUSSION.

Mr. G. F. WILSON, F.R.S., hoped he might be allowed to correct a slight error made, he had no doubt, inadvertently by Mr. Crace Calvert, in one part of his subject. He stated that the oleic acid, manufactured by Price & Co., at Vauxhall, was now made applicable for Turkey red dyeing, through the discovery of Pelouze. That of oil in Turkey red dyeing, was too important a one have been overlooked by Price's Patent Candle Company. After seeing the various results obtained from different samples of olive oil by the manufacturer's test, they investigated and discovered the cause, and described the use of oleic acid in a specification years before Pelouze's paper. While making this correction, he begged to say he entirely concurred with Mr. Calvert in opinion of the value of Pelouze's discovery of the permanent acidification of oils. To all those engaged in experiments on fatty bodies, this discovery gave at once a clue to what had long been a great puzzle.

Mr. PEARSELL wished to express the gratification which he had listened to Mr. Crace Calvert's paper. With reference to the employment of soap in the process of sugar refining, and with regard to the use of sulphurous acid in the same process, he could not but express the great caution with which Mr. Calvert had spoken of these new discoveries, abstaining from anticipating the results which time and practical experience alone could give. The manner in which views had been advanced upon discoveries not yet quite matured, was in his opinion, an example worthy of imitation, and of those who were merely acquainted with the theories of the new discoveries might derive a useful lesson from the way in which the method of employing sulphurous

personally carried out many points introduced, was more worthy of the analyses taken at different stages of the results at each of the greatest nicety. The alloys they conducted powers must extraordinary, of complete examination, the influence of matter being found to

a few brief remarks in Mr. Calvert's interesting of iron. He was years since, in connection, made a chemical which took place during that in this operation that was oxidised, and Calvert's table, almost of carbon was made of the refinery process, in fact, be regarded as the hardness, however, for purposes. It dissolved and the product was steel. Mr. Calvert had drawn a striking contrast of the continent and of England. Every encouragement was given for such knowledge, whilst, in England, the opportunities few, but many difficulties. Although there were good schools of they were not upon that scale of liberality which rendered them available to a man. A case had occurred under his own in the last few days in an establishment was connected. A young man, by his family, had raised himself to be a foreman, temporarily suspended his labours and had South America to this country, in order to the study of applied chemistry, with a view himself in the branch of manufactures in was engaged. He (Mr. Clarke) obtained his into the School of Mines, and he thought it that a young man who had displayed such devotion as to travel from the other side of the acquisition of knowledge requisite for the of his art should be obliged to pay any fees at all. The want of the present day was schools of chemistry, in which the working classes might be instructed now, which might be applied to the several of manufactures in which they were engaged. The suggestion thrown out by Mr. Calvert were followed by the action of the Society, some small grant might be obtained, which could be to this object.

The CHAIRMAN remarked that it was said by Sidney Smith, that every individual, however humble, had a perfect right to find fault, but that a man ought to have arrived at very considerable eminence before he should presume to praise. Were he to follow this dictum on the present occasion, it would place him in an awkward position, inasmuch as he was unable to find fault; he must either praise or say nothing at all. There was one point in particular which Mr. Calvert had illustrated in an admirable manner: that was the immense commercial good that arose from abstract studies. There could be no doubt that many of the points put forward that evening had arisen through the abstractedly scientific discoveries made by others. He need hardly allude to a more marked instance of this than was afforded by the colouring matter called nitroso-phenylene. The discovery of this substance had resulted from the production of dinitro-benzole, dinitro-cumole, and other similar compounds, which, at the time they were discovered, appeared useless as regarded their application to the arts and sciences, serving apparently merely to develop general laws, in the investigation of which scientific chemists were more especially interested. But now they found that the prosecution of these researches with a practical end in view, had resulted in the production of these magnificent colours from the oil of coal tar, varied in their hues according to the degree of oxydation or de-oxydation resorted to; but they would never have heard of these valuable productions but for the purely scientific researches of other chemists. This led him to remark upon the beautiful colouring matter produced from coal tar by Müller, called rosolic acid, the discovery of which, by Runge, was suffered to drop for a period of 20 years, having been, during that time, regarded with doubt and suspicion; but the researches of Müller had resulted in the obtaining of this magnificent purple colour by the action of lime on the vapours arising from coal tar. This dye was not at present of general application, but it was likely soon to become so, and he thought there was every probability of this rosolic acid being turned to useful account in manufactures. With reference to the remarks of Mr. Wilson, it was extraordinary how discoveries made many years ago were, after the lapse of time, brought to useful application. The purely scientific discovery of Chevreul, as to fatty matters being composed of fatty acids and glycerine, was almost day by day yielding fresh results, not only in scientific but also in applied chemistry. With reference to the admirable simplification in the production of sulphurous acid, described by Mr. Crace Calvert, it was matter of wonder that this plan had not been long ago adopted. The ordinary process was first to make sulphurous acid, then by a slow and expensive process to convert it into sulphuric acid, and then by another expensive process it was brought back again to the state of sulphurous acid. Why those tedious processes should have been so long employed, he was at a loss to conceive. He thought Mr. Crace Calvert had introduced to their notice the ultimatum of simplicity in the method of manufacturing sulphurous acid. There were many other points worthy of attention, which, however, he would refrain from touching upon, but he was sure they would agree with him, that the Society was deeply indebted to Mr. Calvert for bringing under their notice such a multitude of interesting new facts, each of which was sure to leave a distinct impression. He had great pleasure in proposing a vote of thanks to Mr. Crace Calvert, for his admirable paper.

The vote of thanks having been passed

MR. CRACE CALVERT said, he felt highly honoured by the way in which his efforts that evening had been received, and he hoped he had been successful in interesting the meeting, and that the desire would be excited for further advance in these matters. Most of the discoveries he had mentioned were recent; where they had proved really successful he had stated it, and where any

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members of committee, of whom six are resident in Leeds four are representatives of principal Institutes in Yorkshire, and Mr. Barnett Blake (Agent and Lecturer). The Yorkshire Union comprises all Institutes which are amongst their objects the intellectual advancement of the operative classes, and in which scientific lectures are given. The terms of subscription are:—Institutes having less than 70 members, 5s. per annum; those having between 70 and 150 members, 10s. per annum; and those having 150 members or upwards, 20s. per annum.

An annual meeting of one delegate from each Institute having less than 200 members, and of two delegates from each Institute having 200 or more members, is held on the Wednesday in Whitsun-week, at some place in Yorkshire selected by the delegates at the pre-meeting. The business transacted is the reading of the report of the committee, the election of officers of the Union for the ensuing year, the choice of the next meeting, and the discussion, as far as time will permit, of such subjects as may be of interest or likely to promote the successful working of the Institutes. The delegates afterwards dine together, and in the evening the meeting is held, at which usually some noble distinction takes the chair.

The report, which is published shortly after the annual meeting, contains the report of the committee and the business transacted at the annual meeting; several extracts from other publications on subjects of interest; a list of lectures by the agent, with terms and periods of time to the several parts of the country; a list of 104 receipt lectures which are lent to Institutes on payment of a small fee; a list of names and addresses of gentlemen who will give gratuitous lectures to Institutes in the Union; a list of professional lecturers, with their terms, &c.; a list of subscriptions to the Union, the agent's account, &c.; and a copious appendix containing, in alphabetical order, reports from the several Institutes in the Union. It concludes with a carefully prepared tabular view of the Institutes, showing in parallel columns the number of members in each, increase or decrease from the previous year, average of members to each Institute, rates of subscription, annual income, number of books in each library, number added during the year, rate of circulation, periodicals in reading-rooms, circulating weekly, monthly, quarterly, and newspapers, lectures delivered during the year, distinguishing paid and unpaid, also scientific, literary, and musical, and numbers of pupils in classes, stating the subject taught and the average attendance of each.

The services of the agent are devoted to delivering lectures at such Institutes as may require them, speaking at soirées or public meetings in behalf of Institutes, consulting with Committees of Institutes whenever they require his advice, visiting places where an opportunity may present itself for the formation of an Institute, and assisting in such formation wherever his services may be required. In cases of lectures or attending soirées, his travelling expenses are paid by the Institute employing him, but in other services his expenses are paid by the Union.

The Yorkshire Union also possesses a library for circulation in villages and small towns, the object being to provide the means where they do not exist for encouraging a taste for a better class of literature than is usually within the reach of the inhabitants of such localities. It comprises 45 sections, each containing 50 volumes, judiciously assorted, and the terms are a subscription of 1d. a week, or 1s. a quarter; 25 subscribers being entitled to one section, 50 subscribers to two sections, and so on in proportion, 10 per cent. being allowed to the local librarian for his trouble, and the expense of postage being paid by the Union.

The committee have also recently purchased, at a cost of £20, an apparatus for the exhibition of dissolving views, and the oxy-hydrogen microscope, the objects

being of an instructive rather than of an amusing character, the chief design being to excite attention to the wonders of nature and art, and to promote a desire for mental improvement in communities which cannot otherwise be successfully appealed to.

Every year a parcel is forwarded to each Institute in the Union containing copies of the report, and such publications, official returns, and other documents as may be sent to the committee for distribution to the several libraries and reading-rooms.

One of the great advantages of the Union is the facility for organisation, and obtaining an expression of public opinion whenever united action may be desirable. It is a centre from which communication may at all times be made with all the Institutes in Yorkshire, and where advice or assistance may be sought in the promotion of any steps for the mental improvement of the operative classes.

The value and importance of the Yorkshire Union have been abundantly proved in the immense increase which has taken place, not only in the number of Mechanics' Institutes in Yorkshire, but in the really practical working of them, as shown in the number of candidates for certificates at the Examinations of the Society of Arts at Huddersfield. The labours of the agent are devoted not only to the delivery of lectures and to taking part in the proceedings of annual soirées, but also to visiting the several localities, and by advice and suggestions founded on long experience, assisting to remove obstacles to success, and pointing out increased means of usefulness. The extent of his labours may be shown by the last report, which states that during the previous year he had delivered 113 lectures, spoken at 31 soirées, and made 86 other visits to Institutes or places where an opening appeared to present itself.

If any further proof were needed of the advantage arising from the promotion of mental cultivation and the spread of intelligence amongst the operative classes, it might be adduced from the experience of the last few months. The recent monetary panic has caused thousands to be thrown out of employment, and yet in no case has it been found necessary to call for additional aid to maintain the public peace. No longer guided by the mere impulse of passion, the operative classes have shown themselves accessible to reason, and amply justified the labours which have been bestowed so prominently by the Yorkshire Union to promote their moral and intellectual prosperity.

The following are the rules of the Yorkshire Union Itinerating Village Library:—

1. That a series of Libraries be formed, to be called "The Itinerating Village Library," for the purpose of lending books to the inhabitants of villages where no Institution or local library exists, or where other circumstances render it desirable.

2. That the subscription requisite to constitute a subscriber to the library be 1d. per week, or 1s. per quarter, paid in advance, and that the number of subscribers requisite to constitute a library station be not less than twenty-five. That, wherever practicable, the sum of £3 be also raised at each station towards the original cost of the books.

3. That the control and management of the Library be intrusted to a Committee, consisting of the Central Committee of the Yorkshire Union, together with one delegate elected by the subscribers at each of the stations, where there are not less than fifty subscribers. That this committee shall meet at least once every three months, three to be a quorum. The committee shall select and purchase books, and solicit donations of money and books for extending the operations of the library. They shall be empowered to engage a general librarian, the local sub-librarians, and such other officers as may be requisite; to fix the period for which each book shall be lent, and the amount of fine for neglecting to return it at the

and delegates shall elect four members to supply the vacancies.

Libraries and all payments to or from communications in reference to Mr. Isaiah Thomas, Hon. Librarian, Mechanics' Institution, Leeds.

shall be exchanged, or be returned to Mr. [redacted] Leeds.

WINGTON MUSEUM

ending 13th Feb. 1907, the winter
— in Monday, Tuesday, and Sat-
— or Monday and Tuesday
— three Students' days, admission
— one Students' evening. Winter

Correspondence

2. Motivation.

... turned in the Society of the Jour-
... steam machinery upon an
... that I had used it 33
... January 30, 1854, born to

W. SMITH

... adjourned, the more
... as shown by the number
... doubtless, many val-
... of deep cultivation
... ward, which would have

A. D. Lacy, of Thibodaux, La., is maturing the details of the year 1855. I will be the part of Mr. Lacy in the sentences in the line of the against Mr. Fowler's for the progress of the render aid, other than are perfected. We doubt will be the lot of those difficulties, in rendering good cause, even though patent the particular public.

...with Mr. Fowler: as
...the walls of the Institute
...the application of the capstan
...is true, he has adopted
...two grooved drums, known
...having been applied by
...their pillar cranes.

in the year 1859, of the year 1857, it will be seen that the application of the capstan, in the case of the rope, is the actuating of the necessary force to move the rope in covering motion to agricultural purposes, and explaining it when the rope is endless. It is to be noted our reason for the disclaimer, this having been simply Lord Willoughby D'Eresby's publication and mode of operations.

Countess. Mr. Fowler's plan is an improvement in detail on Lord Willoughby D'Ercsby's, as shown in his publication, on account of the increased diameter of drums; but, having studied the question, I may venture an opinion, that Mr. Fowler, even if using the endless rope, will yet come back to the single ungrooved capstan system, properly proportioned, working upon a vertical axis, and having guide discs, &c., as shown in the detailed

... ..
... ..
... ..
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... ..
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the property, the libraries
seven trustees, elected.
committee:—W. F.
Hope Shaw, James
son, and James Hole.
duced to three, the

drawings of the patent numbered 1,989, of the year 1857, or some other efficient method of floating the rope, &c.

The reasons for entertaining this opinion will be evident to the practical mechanic examining the subject, on account of the undue bending and straightening of the rope when the double cylinder capstan is employed.

Doubtless, much money and time have been spent in bringing the application of the rope-traction system to its present state of efficiency; but I yet think that it must be with a rope of considerable length, used as proposed in the first instance, in the respective patents of Messrs. Lacy, of Thirsk, and Smith, of Woolston, and practised by Mr. Fowler in his first endeavours, thus avoiding the shifting of the engine for less than say 10 acres of land ploughed.

When the drum is used, having the rope coiled and uncoiled from on and off it, it becomes difficult to apply the motive-power in a constant form, from the difference in the working diameters of the coil on the barrel; this inconvenience was, doubtless, found very great, but perhaps not more so than that arising from the immense wear and tear caused by the rope coiling on the top of itself, with a tension of, say a ton. Again, this was greatly enhanced by the absence of any apparatus to cause the rope to coil regularly on the drum—at least, this was a defect I noticed in any machinery I have seen at work; but, in mentioning this, I do not consider it an oversight by the constructors, as practical experience in the use of ropes for other purposes, has taught me the great difficulty of getting any such apparatus to act efficiently when a great strain is on the rope.

It is not for me here to refer to the details of patent number 1989, of the year 1857, but, I do hope, sir, if my health be spared, to be able, before this year is out, to lay before your Society the details of the experiments contemplated when the first set of machinery, under that patent, is completed, which, I trust, will be the case in the course of a couple of months.

I fear I may weary you with the length of this communication, or I would make some remarks upon the rotary digging system, but, as it is, I will content myself by assuring you there is at least one inventor not despairing of success or in want of remuneration till his task be completed. I will only remark further, there are reasonable grounds to anticipate that the prognostications of the judges of the Stirlingshire Agricultural Society will be fulfilled. They say in their report on steam-ploughing to that Society:—"In the progress of improvements, it may not be far distant when the engine will be enabled to do its work efficiently, without the necessity of leaving a corner of the field, and thereby obviate the disadvantage of moving over it."—I am, &c.,

WM. COLLETT HOMERSHAM.

14, Adelphi-terrace, Feb. 15, 1858.

Proceedings of Institutions.

HANLEY (STAFFORDSHIRE).—A conversazione of the members, exclusively, was held in the lecture-hall of the Pottery Mechanics' Institution, on Tuesday, 9th February. The meeting was numerously attended, and the proceedings were diversified by an exhibition of paintings, engravings, and other works of art, articles of vertu, &c. There were two brief addresses, one by Mr. Charles Alferi, on "Photographic Art," the other on the "Geology of the locality," by Mr. John Scott. Some performances were given by an Amateur Musical Company.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Vol. 25.

Delivered on 8th February, 1858.

2. Bill—London Corporation.
Foreign Refugees—Paper.
Bank of England—Copy of Letter.

Delivered on 6th February, 1858.
26. East India (Mutinies)—Copies of Letters.

Delivered on 9th February, 1858.

37. Naval Receipt and Expenditure—Account.
Riots in Belfast—Report of the Commissioners.
Mutinies in India—Letters from the Court of Directors.
Bessarabian Frontier, &c.—Treaty.
Prussia (Marriage of H.R.H. the Princess Royal)—Treaty.
Sardinia (Post-office Arrangements)—Convention.

Delivered on 10th February, 1858.

29. Public Income and Expenditure (Balance Sheet)—Account.
48. Bank of England—Copy of a Letter.
60. East India Company (Receipts and Disbursements)—Estimate.
12. Bill—Lady Havelock and Sir H. M. Havelock's Annuities.
Foreign Refugees—Despatch from Count Walewski's to Count de Ferniguy.

Delivered on 11th February, 1858.

27. Navy Estimates.
30. Factory Children (York and Lancaster)—Returns.
33. East India (Bishops and Cathedral Establishments, &c.)—Return.
35. East India (Steam-ship *Austria*)—Return.
36. Metropolitan Improvements—Statement of Advances.
38. Lunacy—Account.
39. Post Office Department (Packet Service)—Estimate.
43. Court of Session (Scotland)—Return.
45. Lighthouse at Godrevy—Return.
6. Bills—Heirs (Scotland).
7. ——— Valuation of Lands (Scotland) Act Amendment.
13. ——— Gaols and Houses of Correction.
14. ——— Portumnus Bridge (Ireland).
Certified Industrial and Ragged Schools—Minute of the Lords of the Committee of Privy Council on Education.
East Indies (Mutinies)—Appendix (B) to further Papers (No. 6).

Delivered on 12th February, 1858.

32. East India (Civil Service)—Return.
34. Paper Duties—Returns.
42. Poor Relief (Scotland)—Return.
53. Justices of the Peace (Ireland)—Copy of a Letter.
58. East India (Sepoy at Meerut)—Copy of Papers.
59. East India (Cadetships)—Return.

Delivered on 13th and 15th February, 1858.

55. Savings Banks—Return.
66. Army Estimates.
30 (1). Factory Children (County of York)—Return.
41. Burial Grounds (Metropolis)—Return.
75. East India (Improvements in Administration)—Return.
16. Bills—Ecclesiastical Residences (Ireland).
17. ——— Churches, &c. (Ireland).
18. Church Rates Abolition.
19. Clerks of Petty Sessions (Ireland).

Delivered on 16th February, 1858.

56. East India (Military Force)—Return.
68. Trade and Navigation—Accounts (31st December, 1857).
76. Bank of England—Annual Accounts.
11. Bills—Markets and Fairs (Ireland).
15. ——— Conspiracy to Murder.
Sanitary Condition of the Army—Report of the Commissioners

MEETINGS FOR THE ENSUING WEEK.

Mon. Actuaries, 7.

Architects, 8. I. Mr. S. Smirke, "A brief Communication on the subject of Water Supply in Towns." II. Mr. G. E. Burnell, "On the Modern Applications of Hydraulic Limes and other Cementitious Materials to constructive purposes."

Geographical, 8½. I. Mr. Cyril C. Graham, "Explorations in the Desert of the Hauran." II. Mr. Alfred R. Wallace, "Account of the Arru Islands." III. Capt. J. Ballem, "Extract of the Journal of the schooner *Ella Scott*."

Tues. Royal Inst., 3. Prof. Huxley, "On Biology."
Civil Engineers, 8. Mr. F. C. Webb, Assoc. Inst. C.E., "On the Practical Operations connected with the Paying-out and Repairing of Submarine Telegraph Cables."
Med. and Chirurg., 8½.
Zoological, 9.

Wed. Royal Soc. Lit., 4½.
Society of Arts, 8. Mr. W. Stones, "On New Zealand and its Resources."

Geological, 8. I. Signor G. G. Gemmellaro, "On the Gradual Elevation of a part of the Coast of Sicily." II. Mr. K. Macnab, "On the occurrence of Sea-shells in a Peat-moss at Abernethy." III. Mr. T. F. Jamieson, "On some striated Stones and Sea-shells at high levels in Scotland." IV. Mr. R. Mason, "On Changes of Level in the country near Tenby."

Archæological Asso., 6½.
Thurs. Royal Inst., 3. Prof. Tyndall, "On Heat."
Royal Society Club, 6.

Naturalists, 7.
Antiquaries, 8.
Royal, 8½.

Fri. Royal Inst., 8½. Prof. Baden Powell, "On Rotatory Stability, and its Applications," illustrated by the apparatus of Prof. C. Piazzi Smyth.

Sat. Royal Inst., 3. Prof. Bixham, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

cified period; and generally to pass such bye-laws as may be requisite for the proper management of the business entrusted to them. The seat of the committee to be in Leeds.

4. At each station where there are fifty subscribers or upwards, the subscribers shall have the right of annually electing one representative to the annual meetings of the Union. The meeting of the subscribers for this purpose to be summoned by the local librarian, one month previous to the annual meeting of the Yorkshire Union of Mechanics' Institutes; and the name of the delegate appointed to be immediately sent to the Secretaries of the Yorkshire Union.

5. That the duties of the general librarian shall be to purchase the books ordered by the Committee; to submit all donations of books to their sanction; to obtain catalogues of books from the various booksellers and publishers; to see that all books issued to the local stations are in proper condition, and stamped with the Union stamp, and generally to watch over the interests and discharge the duties connected with the Library. The remuneration for his services to be determined by the Committee.

6. That the duties of the local librarian shall be to issue books to the subscribers, and receive them back, keeping a record of the same; to receive the subscriptions and hand them over, with a list of the subscribers verified by the auditors, to the cash secretary, every three months; to see that any books lost or damaged by a subscriber are replaced by him; to forward the sections half-yearly to Leeds, or such other place as the Committee may direct; and to canvass for new subscribers in his district. That an acknowledgment be made to the local librarian of one-tenth of the subscriptions received by him, except when otherwise determined by the Committee. The librarian at each station shall be provided with a book for registering the issues of the books under his charge, and another for keeping an account of subscriptions and fines, and that the entries be made, and the accounts kept, and the same presented to the Central Committee; and that as often as the latter shall direct, both, or either, of the books shall be sent for their inspection, and shall at all times be open to the examination of an auditor appointed by the subscribers.

7. That the cash secretary receive and examine the accounts from the local librarians, and pay all monies into the hands of the treasurer of the Yorkshire Union of Mechanics' Institutes, who shall keep a distinct account of the same.

8. That the library be divided into sections, each containing fifty volumes, and that the sections be distributed among the stations in the following proportions:—

Stations containing	Shall be entitled to
25 or more subscribers.....	1 section or 50 vols.
50 ditto.....	2 ditto. 100 do.
75 ditto.....	3 ditto. 150 do.

Or in the above proportion, and so on; every additional twenty-five subscribers being entitled to an additional section of fifty volumes. The section to be changed every six months.

9. Each section of fifty volumes to contain a well-selected variety of books, so as to be (as far as possible) complete in itself. No volumes belonging to one section to be intermingled with those of another section. All volumes issued to the stations to be progressively numbered, and stamped with the words "Y. U. Itinerating Village Library, section A, B, C, D," &c. All additions to the library to be reserved until the number and variety are sufficient for a complete section.

10. That in order to protect the property, the libraries shall be vested in the following seven trustees, elected, in the first instance, by the Central Committee:—
W. F. Hook, D.D., Edward Baines, John Kitson, Wm. Crowther, Thos. F. James Hole, &c., the

Central Committee and delegates shall elect four additional trustees to supply the vacancies.

All applications for libraries, and all payments in account of the library, or communications in reference to them, to be made to Mr. Isaiah Dixon, Hon. Librarian and Cash Secretary, Mechanics' Institution, Leeds.

* * All books, when exchanged, to be returned to Duthie, 17, Albion-street, Leeds.

SOUTH KENSINGTON MUSEUM.

During the week ending 13th Feb., 1858, the visits have been as follows:—On Monday, Tuesday, and Wednesday, free days, 3,056; on Monday and Tuesday evenings, 3,756. On the three Students' days (admission to the public 6d.), 1,207; one Students' evening, Wednesday, 349. Total 8,868.

Home Correspondence.

STEAM CULTIVATION.

SIR,—I did not, as reported in the *Society of Arts*, state that I employed my steam machinery an average 39 days in the year, but that I had used it 39 days in the two years from January 30, 1856, to the present time.—I am, &c.,

W. S. M.

Woolston, Feb. 14, 1858.

SIR,—I much regret the discussion on Mr. Fowler's paper on steam-ploughing was not adjourned, so, as, from the interest excited, as shown by the presence of agricultural gentlemen present, doubtless, many valuable facts relating to the benefits of deep cultivation would have been brought forward, which would have cheered inventors in their exertions.

Having been engaged for Mr. A. D. Lacy, of Leeds, for upwards of twelve months, in maturing the plan for the patent numbered 2,641, of the year 1855, I venture to enter my protest, on the part of Mr. Lacy, particular, and of the various patentees in the steam-cultivating business in general, against Mr. Fowler's insinuation that it is necessary, for the progress of the subject, that the public should render aid, other than patronage when the inventions are perfected. We do not, ample tangible remuneration will be the lot of those who succeed, by their inventive faculties, in rendering the slightest assistance to the good cause, even if they are not enabled to secure by patent the privilege of invention they introduce to the public.

This, I believe, is now the case with Mr. Fowler. If I read the drawings on the walls of the Institution aright, he comes now to the application of the cable for actuating an endless rope. It is true, he has added to that design the form with two grooved drums, but by the practical mechanic as having been applied by Messrs. Sharp and Roberts in their pillar cranes.

In the patent numbered 1,989, of the year 1857, it may be found that we claim the application of the cable, in this and other forms, to the actuating of the necessary ropes or chains used for conveying motion to agricultural implements, but disclaiming it when the rope is used for the purpose of pulling a vessel. I wish to put on record our reason for the disclaimer, this having been simply Lord Willoughby D'Eresby's publication and mode of operations.

Doubtless, Mr. Fowler's plan is an improvement on Lord Willoughby D'Eresby's, as shown in his publication, on account of the increased diameter of the drums; but, having studied the question, I may venture an opinion, that Mr. Fowler, even if using the endless rope, will yet come back to the single ungrooved cable system, properly proportioned, working upon a vertical axis, and having guide discs, &c., as shown in the detail

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Adelphi Terrace, Feb. 15, 1954

Proceedings

HANLEY (STAFFORDSHIRE). — A meeting of the members, exclusively, was held at the Staffordshire Pottery Mechanics' Institute on Monday evening last. The meeting was presided over by Mr. J. W. Gurney. The proceedings were diversified by an exhibition of prints, engravings, and other works of art, and a lecture by Mr. J. W. Gurney on "Photographic Art." The first of the series of lectures given by Mr. J. W. Gurney was on "The History of Photography," and was well attended.

PRINTED SESSIONAL PAPERS

8. 1911—London Corporation—
Foreign Exchange—Paper—
Bank of England—Copy of Letter.

V **Mr. W. Stones,** "On New Zealand and
to Australia." I. Signor G. G. Gemmellaro, "On the
Evolution of a part of the Coast of Sicily." II.
E. Johnston, "On the occurrence of Sea-shells in
the Tertiary." III. Mr. T. F. Jameson, "On
terrestrial fossils and sea-shells at high levels in Scotland."
Dr. L. Mammie, "On Changes of Level in the
Tertiary of Scotland."
Prof. J. H. Mather, "On the Tertiary of the West of Scotland."

[Faint handwritten notes, possibly bleed-through from the reverse side.]

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 12, 1858.]

Dated 23rd December, 1857.

3148. William Munn, Hackney, Middlesex—Improvements in stereoscopic apparatus.

Dated 7th January, 1858.

26. François Philippe Cappon, Marans, France—Self-acting pads for doors, shutters, windows, or other similar shuttles.

Dated 18th January, 1858.

80. Richard Archibald Brooman, 166, Fleet street—Improvements in machinery for the manufacture of pipes and tubes. (A communication.)

Dated 23rd January, 1858.

125. Charles Frédéric Vasecot, 45, Essex-street, Strand—A single and double acting machine with electro-magnetic motive power. (A communication.)

Dated 26th January, 1858.

137. Pearson Hill, Hampstead, Middlesex—Improvements in machinery for making cams and for cutting and shaping metals and other materials.

139. George Price Simcox, Hendham Vale Works, Harpurhey, near Manchester—The application of certain materials in the manufacture of carpets.

141. William Edward Newton, 66, Chancery-lane—Improved machinery for mining coal and other mineral substances. (A communication.)

143. William Davis Hirst, Mount-street, Grosvenor-square—A stand for soda-water bottles and other bottles of a similar form.

144. John Harthan and Ezra Harthan, Timbersbrook, near Congleton—An improved engine for obtaining motive power.

145. Ralph Heaton, jun., and George Heaton, Birmingham—An improvement or improvements in annealing metals.

Dated 27th January, 1858.

147. Arthur Bird, Birmingham—A new or improved spring platform or mattress for bedsteads and other articles used for sitting, lying, or reclining upon.

- George James Wainwright, Dukinfield—Improvements in drawing fibrous materials.

149. John Wignall Midgley, Keighley, Yorkshire—An improved construction of covered roller to be used in preparing and spinning machinery.

Dated 28th January, 1858.

150. James Murdoch Napier, Vine-street, York road, and William Thorburn, 19, Sussex-place, Vine-street, York-road—Improvements in machinery for planing, shaping, and slotting.

151. Constantine Nicolaus Kottula, Liverpool—Improvements in the manufacture of neutral soap.

153. Louis Caemmerer, Ghent, Belgium—Improvements in the apparatus for cleaning the top rollers and fluted rollers of the different spinning machines.

154. William Spence, 50, Chancery-lane—An improved pot for chimneys and ventilation. (A communication.)

155. Edmond Liouvil, Paris—Improvements in apparatus for aerated liquids.

156. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the manufacture of metal pipes, and in the apparatus employed therein. (A communication.)

157. Thomas Armitage, Hood-street, Coventry—Improvements in elastic fabrics.

Dated 29th January, 1858.

158. William Treleven Fox, Birkenhead—Improvements in the bending and reefing of ships' and other vessels' sails, together with a new application for the leeches and foot.

159. John Bethell, 8, Parliament-street, Westminster—Improvements in the manufacture of coke and fuel.

160. William Henry Tooth, 9, Summer-street, Southwark—Improvements in polishing plate glass, sheet glass, and other substances.

162. John Elder, Glasgow—Improvements in the arrangement or construction of steam engines and boilers.

163. George Chapman, Leicester—An improvement in socks, drawers, and other garments made of knitted fabrics.

164. Richard Archibald Brooman, 166, Fleet-street—Improvements in apparatus for measuring water, gas, and other fluids. (A communication.)

165. Robert Ware, Plumstead, Kent—Improvements in galvanic batteries.

166. James Witherspoon, Glengarnock Iron Works, Ayr, N.B.—Improvements in railway brakes.

167. James Goodwin, Milton, N.B.—Improvements in the treatment, preparation, and cleansing of textile fabrics and materials.

168. Herbert William Hart, Birmingham—Improvements in regulating the pressure of gas.

Dated 30th January, 1858.

169. William Kaye and Charles Kaye, Lockwood, near Huddersfield—Improvements in mattsacks, picks, hoes, hammers, and similar implements and tools.

170. George Garden Nicol, 37, New Broad-street—Improvements in balls or projectiles. (A communication.)

171. Charles Nielson, 50, Lime-street—Improvements in the manufacture of manure from sewage waters.

172. John Newling, Park-street, Grosvenor-square—An improved truss for hernia.

173. Richard Coleman, Chelmsford—Improvements in agricultural implements.

174. John Augustus Bouck, Manchester—Improvements in the manufacture of sulphate of copper, and in obtaining certain useful products from such manufacture.

175. Thomas Taylor, senr., Thomas Taylor, junr., and Henry Nelson, Manchester, and Henry Spencer, Rochdale—Improvements in steam engines, and apparatus connected therewith.

176. Peter Ashcroft, Engineer to the South Eastern Railway—An improved mode of supporting the rails of railways in their chairs.

Dated 1st February, 1858.

178. William Kemble Hall, 36, Cannon-street—Improvements in the manufacture of artificial leather.

180. George Bartholomew, Linnithgow, N.B.—Improvements in horse shoes, and in attaching the same to the horses' feet.

182. William Edward Newton, 66, Chancery-lane—An improved clasp or fastening for joining the ends of belts or bands. (A communication.)

184. Richard Archibald Brooman, 166, Fleet-street—Improvements in burners for generating and burning gas from hydro-carbon fluids. (A communication.)

186. William John Hay, Southsea—An improved composition suitable for covering the caulking of ships and other like purposes, for unting wood and other substances, for filling up seams, and for use as a waterproof composition generally.

Dated 2nd February, 1858.

188. William Edward Newton, 66, Chancery-lane—Improvements in obtaining certain compounds of nitrogen to be applied in the composition of artificial manures, and for other useful purposes. (A communication.)

190. James Sholl, Victoria-grove West, Stoke Newington—Improvements in the manufacture or preparation of paper for writing and copying purposes.

WEEKLY LIST OF PATENTS SEALED.

February 12th.

2158. William Smith Wheatcroft and James Newton Smith.

2159. John Alleyne Bosworth.

2167. Charles Gumm.

2169. Samuel Draper.

2190. William Henry Miller and Henry Edward Skinner.

2194. Thomas Keddy.

2214. Amos Pierce Chamberlain.

2272. François Xavier Gentil, senr., and Eugene Gentil, junr.

2284. William Clark.

3044. Samuel Clarke.

3080. Edwin Turner and John Charles Pearce.

February 16th.

2179. Archibald Smith.

2191. Charles Nightingale.

2196. Samuel Bottomley, James Bottomley, and Thomas Bottomley.

2200. Pier Alberto Balestrini.

2204. Ferdinand Potts.

2208. James Murdoch Napier.

2212. Rd. Archibald Brooman.

2217. Thomas Ingram.

2219. Joseph Glover and J. Bold.

2221. Victor Hippolyte Laurent.

2222. Peter Ashcroft.

2223. Henry Cartwright.

2225. Jules Dufau.

2232. Ludvig Levinson.

2239. Alfred Hamilton.

2241. Thomas Macanay.

2267. William Harling, John Matthew Todd, and Thomas Harling.

2286. George Hallen Cottam and Henry Richard Cottam.

2295. Robinson Elliott.

2308. Perry G. Gardiner.

2310. John Yull Borland.

2332. William Lewis and William Henry Lewis.

2371. Charles Lungle.

2697. John B. Slapton.

2777. George Hallen Cottam and Henry Richard Cottam.

2238. George Lowry.

2295. Joseph Francis and Charles Manby.

3054. John Chadwick and Arthur Elliott.

3111. Samuel Darling.

3112. Charles Winslow.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

February 6th.

308. William Beckett Johnson.

322. John Ramsbottom.

335. John Henry Johnson.

346. Christophe François Delabarre.

February 9th.

313. Edward Sparkhall.

321. George Rennie.

327. Richard Shirley Harris.

- February 11th.

328. John Foster.

431. Alex. Theophilus Blakely.

- February 12th.

355. Samuel Barlow Wright and Henry Thomas Green.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4056	Feb. 12.	The Hand Seed Planting Machine.....	Joseph Hoare	Old Fishbourne, Roeham, Sussex.
4087	" 13.	The Improved Sheep Shears	Robert Sorby and Sons	Sheffield.
4088	" 16.	Life Preserver	James Armstrong	Irthlington, Cumberland.
4089	" 17.	Spring Hat Suspender	James Chesterman	Sheffield.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 26, 1858.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.

2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to the Society's House, Adelphi, London, W.C., carriage paid.

The days for receiving articles are, Thursday, the 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief but clear description of the invention, with a wood-block (when possible) for illustrating the Catalogue, and a reference to any publication in which the Invention is described.

All drawings exhibited must be framed.

No charge whatever is made for space, and the Exhibition is free.

ARTISTIC COPYRIGHT.

A Report as to the existing English Common and Statute Law, relative to this subject, has been prepared at the request of the Committee, by D. Robertson Blaine, Esq., Barrister-at-Law, Reporter to the Committee, and may be obtained of the Society's publishers, Messrs. Bell and Daldy, Fleet-street. Price sixpence.

SPECIAL PRIZE.

A Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the Rev. F. Trench and J. MacGregor, Esq.,) and the Society's Silver Medal, is offered for a Writing-case suited for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following points, which will influence the Council in making their award:—

Lightness,
Smallness of size,
The avoidance (if possible) of fluid ink,
Durability,
Cheapness, with a guaranteed supply, and
General applicability to the duties, habits, and requirements of the above classes.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 8th May next.

EXAMINATION PRIZE FUND FOR 1858.

The following circular letter has been addressed to the Members of the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., Jan. 30, 1858.

SIR,—I am instructed by the Council to inform you that the Examination Prize Fund for 1858 is now opened. The donations for 1857 were contributed by twenty-three Members, and there is a small balance to carry forward.

The Council draw attention to the fact, that last year's Examinations were limited to two centres. At these two centres, pupils from thirty-seven Institutions only presented themselves; ten of them were from the metropolitan district, London being one centre; sixteen from Yorkshire, Huddersfield being the second centre, leaving but eleven for all England, Ireland, Scotland, and Wales. This unequal distribution was one of the reasons which satisfied the Council that the system was not adapted to meet the wants of all the Institutions. They, therefore, resolved to bring the Examinations to the very doors of the Institutions, by such step of course throwing open the prize fund to the students of every Institution.

The Council have also decided on contributing a certain mileage towards the travelling expenses of those candidates who desire to receive personally and publicly their prizes, and also £5 towards the travelling expenses of each pupil, who, obtaining three of the Society's certificates of the first class in the subjects contained in the Oxford programme, is desirous to contend for the degree of Associate at the Oxford Examinations. These changes lead the Council to believe that a considerably larger sum than last year will be required for the prizes, and I am, therefore, instructed to draw the attention of all the members to the circumstances.

Donations can be remitted to Mr. Samuel Thomas Davenport, Financial Officer, Society of Arts, Adelphi, London, to whom Post-office Orders should be made payable.

I am, Sir, your obedient servant,

P. LE NEVE FOSTER, Secretary.

The following is the list of Donations up to the present date:—

T. D. Acland, Member of Council.....	£ 5 5
John Ames.....	5 5
J. G. Appold, Auditor	10 10
Harry Chester, Vice-Pres.	10 10
Henry Cole, C.B., Vice-Pres.	1 0
G. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation).....	10 10
F. Seymour Haden (annual)	2 2
William Hawkeworth	1 1
Edward Highton (annual)	2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.....	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Coun- cil (second donation)....	10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford.....	1 1
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council (third donation).....	10 10

EXAMINATIONS.

On Thursday evening, the 18th inst., a meeting was held at the Burnley Mechanics' Institution, Sir J. Kaye Shuttleworth, Bart., in the chair, at which Sir Thomas Phillips attended as a deputation, at the request of the Council of the Society of Arts, and explained the Society's system of Examinations for 1858. The Committee of the East Lancashire Union of Mechanics' Institutions will form the Local Board of Examiners for that district.

A public meeting was held at Crosby-hall, Bishopsgate-street, by permission of the Evening Classes Committee, on Friday evening, February 19th, J. J. Mechi, Esq., in the chair.

The following gentlemen, at the request of the Council, attended as a deputation:—C. Wentworth Dilke, (Chairman of the Council), Harry Chester and J. Griffith Frith (Members of the Council), with P. Le Neve Foster (Secretary), and Charles Critchett (Assistant Secretary).

The Society's scheme of Examinations for the present year was explained, and the following resolution was carried unanimously:—

Resolved,—That this meeting believes that the system of Examinations of members of Literary and Mechanics' Institutions, as carried out by the Society of Arts, is calculated greatly to promote the cause of popular education; and having been informed of the intentions of the Council with reference to the Examination for the present year, strongly urges upon the Committees and Members of Institutions in London, to co-operate with the Council of the Society in carrying out their scheme.

A vote of thanks was then passed to the chairman, and the meeting separated.

The Committee of the Devonport Mechanics' Institute met on Monday, the 22nd inst., when Mr. Henry Cole, C.B., and Dr. Lyon Playfair, C.B., attended as a deputation, at the request of the Council, to explain the Society's system of Examinations. The Committee unanimously agreed to make the necessary arrangements for the formation of a Local Board of Examiners for the counties of Devon and Cornwall.

TWELFTH ORDINARY MEETING.

WEDNESDAY, FEB. 24, 1858.

The Twelfth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 24th inst., George Moffatt, Esq., M.P., Vice-President, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Mr. George F. Grove, W. R., Q.C., F.R.S.

The following Institution has been taken into consideration for the next announcement:—

The Young Men's Literary Association.

The following Institution has been taken into consideration for the next announcement:—

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The legend of the origin of the North Island is as follows:—

Maui with his wife were in a canoe fishing, and the line, on one occasion, being pulled in with difficulty, he found that the hook had attached itself to a huge and wonderful fish; and when he had succeeded in drawing it up to the surface, he leaped from his canoe on to the newly-caught monster, exclaiming to his wife, "Whenua, (land)—thus was the North Island fished up from the ocean.

As may be supposed, cross-examination fails to elicit satisfactory answers to the questions:—Where did the tree grow out of which Maui's canoe was made, before the land was formed? Where did he get his fishing line? How had he previously subsisted? The replies being, "Don't know."

Nevertheless, the North Island has no other name than Te ika a Maui—the fish of Maui.

The Middle Island, from the circumstance of the Jade being found there, of which the choice native war weapon used by the chiefs is made, is called Te Wahi Pounamu—the place of the Pounamu.

The sea is called Te Moana, in which word we may detect an attempt to depict the sound of its well-known hollow moan, as it rolls up on to their extensive sandy beaches. The sun is supposed to go down behind the sea, and run through a hole back again at night, returning through the air during the day.

The New Zealanders deny that their forefathers were cannibals, and assert that it is only within the last few generations that the fierce spirit of war has seized them; and cannibalism arose partly from their being occasionally driven to extremities by hunger, and partly from the idea that by feeding upon the killed enemy, the eater would become possessed of the personal strength and bravery of the deceased; and revenge, payment, compensation, "utu," as it was termed, being the absorbing principle of honour, it came to pass that the friend or child of a person slain in fight would cherish the feeling for many years, until some favourable opportunity occurred, when he could avenge his friend or father's death.

One chief, in speaking of a certain district, told the writer that he knew it well. "There," said he, "we had a fight, and I ate such a chief's eyes."

"What quarrel had you with that individual, or with his tribe?"

"None, personally, but he had killed my father when I was a child."

The natives also state that the islands were once more populous than at the present time, and refer to the numerous deserted paha, or native forts, in support of the statement, but I doubt whether New Zealand was ever much more populous than it was thirty years ago; since that time, for reasons which will be hereafter assigned, the native population has decreased. The number is variously estimated, being a mere conjecture, no attempt at a census, that I am aware of, having been made.

I should myself estimate the native population at from 80,000 to 100,000 souls.

When visited by Cook, the islands were entirely destitute of animals, except a dog and a rat; these probably being the descendants of some which absconded from the earlier ships; the people, therefore, have had no inducement to wander in search of sustenance by hunting, but have always resided in villages, building small huts of rushes, and cultivating kumeras (sweet potatoes), and, when the soil became exhausted, moving to another part of the same valley, allowing the previously cultivated portion to lie in fallow for several years. Each tribe would also plant small quantities of these vegetables, &c., in convenient little nooks near the sea-beach, or by the river side, so that in the proper fishing season the trouble of carriage might be saved.

The tribes consist of a somewhat indefinite mixture of chiefs, free men, and slaves, the last of whom were made

to do the greater portion of the labour, and in battles were placed in front, the chiefs fearing they might otherwise run away, or probably avenge upon their own chiefs some pent-up grievance or offence.

The land, for the most part, is held by a kind of corporate tenure, and when sold, the veriest slave receives some share of the price, if only a piece of tobacco.

I am not aware of a single inch of ground having been discovered which was not the recognised property of an individual or of some tribe in common.

EARLY RELATIONS WITH EUROPEANS.

The Dutch navigator, Tasman, appears to have been the first who discovered these Islands, and the names, "New Zealand" and "Cape Maria Van Diemen," are evidences of his visit; but, beyond these mere names, few particulars are on record; nor was he aware that the land he discovered was part of an island belonging to a group.

To Captain Cook belongs the honour of definitely fixing the extent of these islands, and becoming acquainted with the inhabitants and productions; his visits are recollected with gratitude by all, and it is extremely pleasing to hear them talk of Peni Kuki (Capt. Cook), who came in the thing their fathers imagined at first was a huge bird flying on the sea—the sails being mistaken for its suitably vast wings.

To Cook they attribute the introduction of pigs, potatoes, goats, poultry, the cabbage, and the knowledge of the use of iron instruments; and throughout the land his name is mentioned with affectionate remembrance as their greatest benefactor—as one who was ever kind to them, and never took advantage of their ignorance and helplessness against his fire-arms.

I may here remark that the native name for a ship is *Kai-puka*—"Hill of food;" whether from the large stores they saw on board Cook's vessels, or from the advent of new supplies of food in the shape of pigs, &c., which he left with them, I know not, but it is nevertheless a fact.

Illustrative of the lasting impression which a comparatively trifling circumstance may make at the beginning of the intercourse of civilized with barbarous people, I may remark that Captain Marion, an early French navigator, having had some cause of dissatisfaction with the natives of the harbour wherein his ship was at anchor, took rather severe retribution by destroying several villages on the coast, and killing the inhabitants. He intended to inspire them with a sense of French power, and he succeeded; but, at the same time, he taught hatred, and to this day intense dislike is manifested to the *Mareaus* or *Wiwis*, the name given to the French, from their frequent utterance of the words, *Oui, oui*.

After the settlement of New South Wales was formed, English vessels occasionally called at New Zealand on their way home from that colony, and the account of the massacre of the crew of the *Boyd* gave to Englishmen a horrible notion of the savage character of the natives.

One old Wangaroa chief communicated to the writer his version of the occurrence, and it was thus: "On board the ship were nails, and axes, and iron articles, great prizes to us, and some of our people took them. We now know how wrong you consider it to steal, but we did not understand then; our people saw the iron articles in abundance; they wanted the nails, &c., and took them. The captain purposing (as I now suppose) to intimidate us, seized two of our chiefs and chained them on board. You are now aware that our chiefs are sacred in our eyes, and, as we could not allow them to suffer these indignities, and, moreover, thought the Captain intended to kill them, we resolved to murder the English and release our chiefs,—it was a sad mistake, from *kuwaretanga* (ignorance) on both sides."

Whaling vessels frequenting the Pacific began to call, in order to obtain water, and such fresh provisions as pigs, potatoes, pumpkins, &c., so desirable and necessary

in their long cruises; and the Bay of Islands being a well-sheltered harbour, and easy of access, became the favourite place of resort, until at last two hundred vessels have been known to visit the Bay in one year.

Guns, powder, blankets, clothing of all kinds, and ardent spirits, were thus introduced, and the Bay natives became rich in European goods; unhappily, demoralization resulted from this abundant intercourse with English vessels, and with the good came much evil.

Diseases previously unknown were introduced, and the sad effects of intoxicating habits were too common. Moreover, in a moist climate, it must be apparent that exposure to wet is calculated to induce certain classes of diseases. Before the introduction of European clothes they were accustomed, when wet, to throw off every garment and dry themselves, but since that period, in spite of every warning, the natives, when thoroughly drenched, will stand over the fires in their huts until perfectly dry; hence the frequency of pulmonary complaints amongst them, and, from the causes named, a decrease of population.

IRREGULAR SETTLEMENT.

Captains and mates of whalers and trading vessels from New South Wales, who had been to the place for supplies, particularly in seasons of drought in the Australian colony, became enamoured with the wild romantic freedom of the land contrasted with the stringent formal regulations of the convict colony; there was a charm connected with the idea of being regarded as a little king amongst a tribe; there was mildness of climate, surpassing beauty of scenery, and noble rivers sweeping through thickly-timbered forests, interspersed with lovely fern valleys, whose rich soil, unvisited by drought, brought forth abundantly.

Seamen also thought it would be an easy, merry life, to dwell where tobacco and grog were untaxed and enticingly cheap, being easily obtainable in any quantity, by top-sawing if an experienced hand, and bottom-sawing until he had learnt the mystery.

Thus the one class, retiring masters of vessels, opened stores, where the natives obtained whatever European articles they desired, for which they exchanged agricultural produce; and from these storekeepers, shipmasters visiting the Bay procured provisions and other stores of which they might be in need; the other class, the seamen, set up grog shops for the accommodation of Jack ashore, and so Kororareka became a little British town.

Others located themselves near to the native villages, a proceeding always encouraged by the chiefs, because they reasoned that wherever a white man went, thither would follow white men's goods, and to obtain these was their great anxiety. The foreign trade, if I may so term it, they left to the superior arrangements of the Europeans, but every tribe was particularly anxious to secure the near residence of a *pakeha*, or white man, for the reason stated. Hence they readily parted with plots of land for the white man's house and farm; in the first instance no cause existed to limit his purchases, for there was abundance for all, and, as may be supposed, the payments for land were not large; and what was it worth thirty years ago? Moreover, the settlers who first purchased land in New Zealand had come from the colony of New South Wales or Van Diemen's Land, where the land was then being given away by the Government; consequently their idea of the value of land was not very excessive. The settlers agreed to pay whatever the natives demanded;—it was unoccupied; and just as a Canadian clearing increases the value of the adjacent lands, so the presence of an European increased the value of the property unsold, for he opened a near market for its produce.

Verily, the sweeping accusation as to land-jobbing comes with an ill-grace from Government, who at the very moment when these properties were being bought, were giving away land in other colonies, and who, as I shall subsequently show, have since proposed to assure

the proprietorship of those very unoccupied lands without any payment at all.

As whales were observed to frequent the coasts of New Zealand, the merchants of New South Wales established whaling stations in the neighbourhood of Cook's and Foveaux's Straits, and in those bays to which the whales were noticed to resort. Thus, a large shore population became temporarily located at various points.

That worthy, eccentric clergyman, the Rev. S. Marsden, whose name will pass down the stream of time with the early history of New South Wales, planned a mission to New Zealand, which he personally visited to found, and by degrees the Church Missionary influence became great, and their establishments at Paihia, on the Bay of Islands, and at the Waimate, the latter midway between the Bay and Hokianga, led to the introduction, cultivation, and extensive growth of the vine, water-melons, peaches, apples, and various vegetables; and, by the same means, cattle and horses, goats, sheep, and fowls, ducks and geese, became more generally known to and largely acquired by the natives, and, from the genial character of the climate, thrived amazingly.

A notable character in the early history of New Zealand, the Baron de Thierry, now appears on the stage. He states that he gave a Church of England clergyman a large sum of money, many years ago, to purchase land in New Zealand, and that from this agent he received deeds, setting forth the boundaries of a large district, therein represented to have been sold to the Baron by the natives.

Some years after this purchase, the very idea of which the natives ignore (the only instance of such a denial), the Baron, who had been residing in the Marquesas Islands, of one of which he assumed the title of king, but from disagreement with his subjects, thought it advisable to retire to Sydney, announced his intention of visiting New Zealand, to take possession of his land.

Accompanied by some sixty followers, he sailed from Sydney in a small vessel, and landed on the shores of the Hokianga, of which district he claimed to be the sovereign chief. The long-expected French men-of-war, to support his authority, not making their appearance, and his staff dwindling away as his means became exhausted, Charles, Baron de Thierry in France, King of Nukuhiva, Marquesas, and Sovereign Chief of Hokianga, New Zealand, whose advent had caused much commotion, ceased to—

“Fright the isle from its propriety.”

In the year 1839, the New Zealand Company sent out their first ship, the *Tory*, under the direction of Colonel Wakefield, to purchase land, &c. He visited successively Hokianga, where the Company had purchased one or two small properties; Kaipara, where the natives refused to sell any land at all; and then sailed southward, where he effected a large purchase of land on the shores of Cook's Straits, and formed the present settlement of Wellington.

All these various interests (each party being perfectly independent, and owing no allegiance to the others), being thus located in the land, it requires but little consideration to foresee that unpleasant complications would follow. Collisions between native tribes, between natives and Europeans, and amongst Europeans themselves, were already threatening, and would doubtless have soon taken large dimensions, but for the authoritative colonization by the government. I will name but one or two circumstances in proof of the disorganization which existed.

It was a customary matter, and quite expected, that several men of every crew would abscond, leaving the ship so short of hands that the commander could not put to sea when laden. When a ship had taken her cargo on board, the haunts of the runaways being ascertained by native information, two or three captains with their officers would assemble, well armed, and joining their forces and taking the law into their own hands, would,

unexpectedly, at night, visit the houses of the sawyers with whom these runaways generally found a hiding place, and threaten that unless the men were delivered up, the house should be broken into (which was sometimes done), and as many of the men as could thus be recovered were brought back to the ship, and as soon as sufficient were obtained to enable the vessel to go to sea with the slightest degree of safety, the commander would get away with all speed.

Frequently, when half-way from the colony of New South Wales, an escaped, starving, convict, would be found in the hold of a vessel, determined at all risks to make his way to that traditional Paradise of the condemned, New Zealand. What was a captain to do? It would only have been troublesome and expensive to have kept these men until they could have been thanklessly delivered to the authorities in England, and to put back would not be profitable, so they were generally made to work during the passage, and part of the time in port; they then disappeared by the aid of the sawyers, some of whom were always ready to lend their friendly assistance for such an escape.

The writer observed one morning a party of forty armed Europeans rowing up the Hokianga, and while wondering as to the object of the expedition, noticed them deliberately break into a timber dock, and steal therefrom timber logs and spars to the value of more than £200, for which atrocity no redress, no investigation by the government, could ever be obtained.

I think we may fairly term this the period of “irregular settlement,” when every one did as he liked in his own eyes.

The distribution of letters was on rather an unique principle. The only recognised Postmaster was a merchant at the Bay of Islands, and his was an altogether honorary position. Whenever, on the arrival of a vessel, he found on opening the bag that there were several letters for any district within one or two day's journey, he would enclose them to the principal resident or missionary, who would pay the native bearer, generally with a striped shirt and some tobacco; and the letters being arranged in a row on the mantel-shelf, the addressees would be accessible for the perusal of all chance visitors. Any one happening to call, would say, I am going near to such a person, and will take his letters; thus by slow filtration did letters and newspapers reach their destination. The writer had one letter delivered to him two years and a week old.

GOVERNMENT COLONIZATION.

To put an end to the anomalous condition of matters we have referred to, the British Government resolved to establish a Crown colony, and to Captain Hobson, who had previously visited New Zealand as commander of one of Her Majesty's ships, was entrusted the delicate mission of treating with the native chiefs for the cession of the independence which had been acknowledged by Great Britain, in consequence of a representation made by some chiefs who in 1835 had entered into a confederacy by and with the advice and consent of Her Majesty's resident.

Captain Hobson arrived in the Bay of Islands in January, 1840, and immediately issued three proclamations with only one of which we at present concerned.

After the preamble, the proclamation in question goes on to say, “Her Majesty does not deem it expedient to recognize any titles to land in New Zealand, which are not derived from or confirmed by Her Majesty; but, in order to dispel any apprehension that it is intended to dispossess the owners of any land acquired on equitable conditions, &c., a commission shall be appointed to inquire into and report on all claims to such lands.”

The agreement known as the Waitangi Treaty was subsequently entered into, its principal points being the recognition by the English Government of the “full exclusive, and undisturbed possession of their lands and estates, forests, fisheries, and other properties which the natives may collectively or individually possess.”

the other hand, the natives ceded to Her Majesty "all the rights and powers of sovereignty over their territories," and became British subjects.

From this period the difficulties of the unfortunate emigrants commenced. Rich men seldom emigrate. The emigrant classes are persons of no means at all, or persons of small resources, who leave their native land to improve their circumstances.

Picture to yourselves the condition of these wanderers, to whom a parental Government assumed this position—You shall not buy land from the native owners; that privilege we reserve to ourselves. You cannot buy from the white population or from the New Zealand Company with safety, because their titles may not eventually prove sound, according to our views. And as we, the Government, have as yet no land of our own, you must wait until we have purchased from the natives and are in a position to sell. Hence neither old settlers nor new comers were encouraged to commence working the land, for, after the examination of the titles, their labour might prove to have been in vain; they, therefore, passed their time in restless, anxious, expectation, their energies paralysed, their small substance dwindling, until at length, owing chiefly to these absurd regulations, the colony became so distressed that Government debentures were issued for such paltry sums as 10s. and 5s. Surely we need no other proof of the low ebb to which the colony had become reduced.

When the Government was at length in a position to offer land, it was put up in small quantities to auction, on which occasions the officials and a few speculators did much injury to the lasting interests of the colony. True, by this system the price realised was high, and the amount paid into the Government coffers comparatively large; but this was at the expense of a serious diminution of the means of the poorer settlers, who, when they had acquired their dear land, could only send their produce to the same market as the natives, whose land had cost them nothing.

The policy of extracting as much as possible from the newly arrived, for their small plots of land, and leaving them without capital to work with, was suicidal, as the result too sadly proved. Some left the country, but, with the pertinacity of Englishmen, many remained in the land of their adoption, hoping for brighter days. They exported wood, oil, salt pork, maize, and corn to Sydney, and spars for masts (ordinary house timber not paying the high freight), as well as wool and gum to England, and thus raised a credit for themselves.

At length the gold fever broke out in Australia, where agricultural operations were for a time comparatively neglected. Then New Zealand developed its amazing productive powers, and wheat, maize, potatoes, and timber were largely exported to the Australian colonies.

In addition, the colonists turned their earnest attention to breeding sheep, and New Zealand wool is now becoming a large article of export to England, and this antipodal Britain, like its mother, will build its early foundations on the woolstack.

CLIMATE.

The climate of New Zealand is, on the whole, I believe, superior to all others in the world, perhaps I may rank Van Diemen's Land as its equal, for admitting, what I suppose will not be denied, that a moderate temperature is of vast importance in the acquisition and preservation of health; surely, if the maximum and minimum of such moderate temperature are arrived at by slow gradual changes, we have in that circumstance the most favourable element of health so far as the atmosphere is concerned in securing that great blessing.

Some of the southern countries of Europe have a mean annual temperature equally as high as New Zealand, but there is this important fact to be borne in mind, that whereas in the south of Europe the heat in summer prevents out-door labour during several hours of the

day, and the winters are comparatively cold, in New Zealand the difference of temperature between the winter and summer months is very limited. Thus the mean temperature of the hottest month of the year in Auckland is 67½ deg., and of the coldest month 51½ deg. In London the mean of the hottest month is 64 deg., and the coldest 37 deg.,—in the one case a difference of 16 deg., in the other of 27 deg. These differences will be more apparent from the following comparative tables:—

MEAN TEMPERATURE.

	Annual.	Winter.	Spring.	Summer.	Autumn.
London	50.39	39.12	48.76	62.32	51.35
Auckland	58.48	50.68	56.82	66.38	59.82
Naples	61.40	48.50	58.50	70.83	64.50

MONTHLY MEAN TEMPERATURE (FROM OTHER OBSERVATIONS).

	In London.	In Auckland.
January	36.8	49.5
February	39.6	54.3
March	42.	54.8
April	47.6	58.6
May	55.4	58.8
June	59.8	64.6
July	62.9	69.3
August	62.9	67.0
September	57.7	65.1
October	50.8	59.
November	42.4	56.1
December	38.7	52.1
	49.6	59.1

Doubtless, this equality of temperature is in a great measure owing to the insular character of the colony.

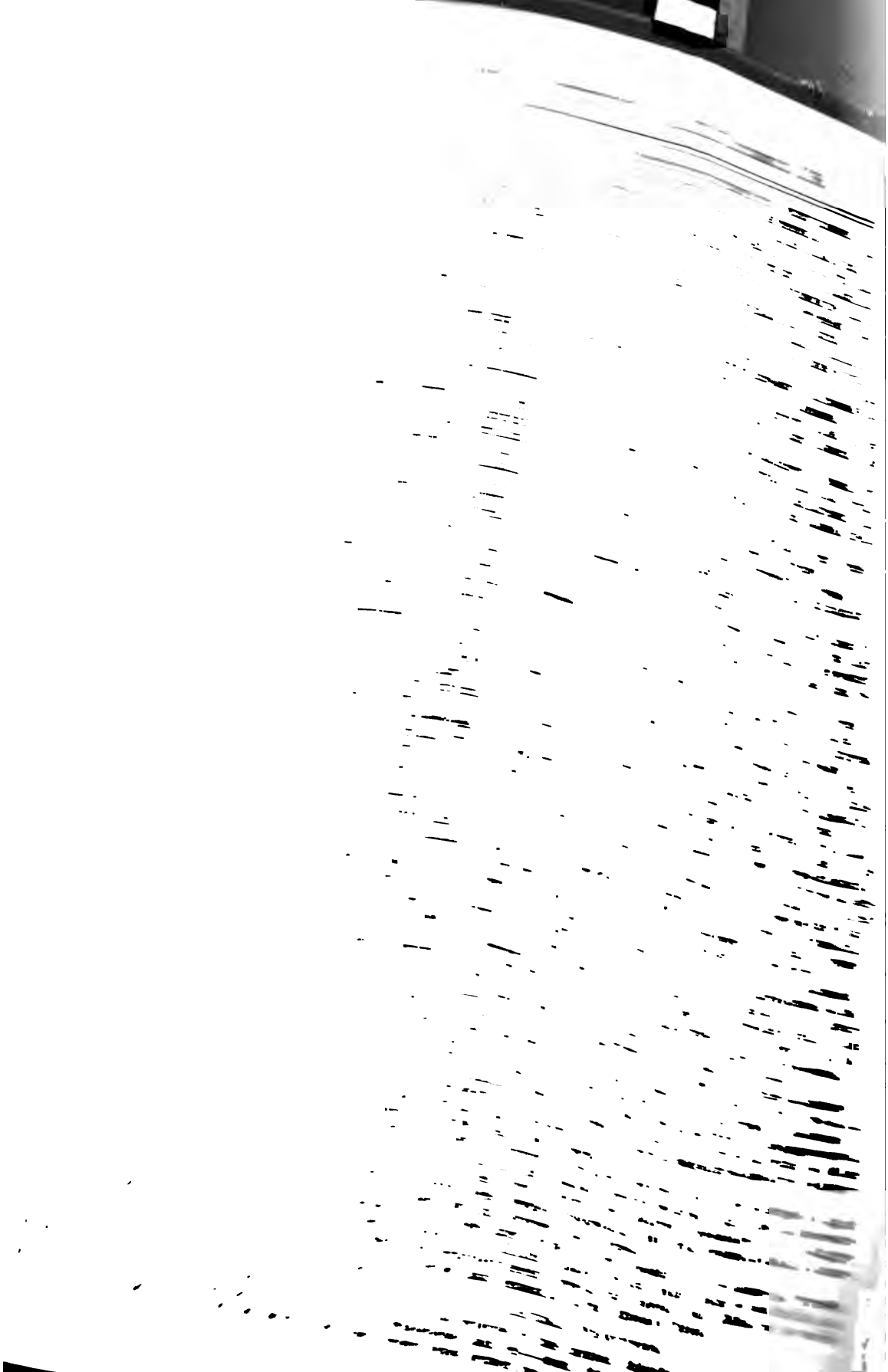
The heat of the sun no sooner raises the temperature of the land, and, in consequence, that of the superincumbent air, than the air on the surface of the land rises, and the air from the sea rushes in to supply its place; thus, a refreshing sea breeze is experienced from morning until afternoon or evening, when the land breeze commences, and generally lasts through the night, until a short time after sunrise.

Northerly winds are damp, being charged with moisture; southerly winds bring dry weather.

New Zealand is remarkably free from diseases, complaints of the eye being the only exception, and of this class there are more frequent cases than in England.

Another remarkable peculiarity consequent upon its climate is the fact, that potatoes and maize flourish side by side in New Zealand, contrary to the ordinary condition of vegetation in Europe, where maize will not ripen in the same circumstances as enable potatoes to become perfect. In our own country, for instance, maize has not been, and therefore, I presume, cannot be successfully cultivated, and potatoes are largely grown. In the south of Europe the potato ceases to be generally cultivated, but maize flourishes.

From Van Diemen's Land potatoes are largely exported to the other colonies of Australia, to Sydney particularly, but maize itself is uncertain. On the other hand, maize is extensively cultivated, and with certainty in New South Wales, making excellent food for horses, poultry, and pigs, but potatoes do not succeed so well. In New Zealand they are much prized by the natives, who have large plantations of both vegetables, and a cob of young corn slightly roasted, or boiled and served with butter, is a dish not to be despised.



Seal skins and oil also contributed to the export trade of New Zealand, but have now almost entirely ceased.

One peculiarity of New Zealand, I have already observed, was the almost entire absence of land quadrupeds when it was first discovered; all animals have been of European introduction.

Of the native birds, although they abound, a very slight notice must suffice, for they afford no article of export; but one or two species are too singular to be passed over in silence. I allude to the extremely curious *Apitergus Australis*, or Kiwi, which is about the size of a common fowl, with undeveloped wings; a ground bird, nocturnal in its habits, it is perhaps the only bird which is so favoured by the chiefs as to be fairly termed game, all other birds being common. The feathers are highly esteemed for making choice dresses. The other is the *Moa*, or *Diornis* of Owen, which was probably the largest bird ever existent on this earth, and stood 16 feet high. The latter is now extinct; the former, although rare, is procurable in several parts of the country. I understand that a *Moa's* egg has just been found; it is stated to be a foot long, nine inches in diameter, and 27 inches in circumference.*

In passing, I would remark that a moderately good shot need not fear the failure of supplies when travelling, as large wood pigeons abounding in all the forests, and wild ducks in the rivers; wild pigeons are met with in many tracts, and in some parts wild goats.

The halibut iris, mutton fish, is prized by the natives, though tough eating; the shells are used in constructing native fish-hooks, and large quantities are brought to England, where the iridescent pearly linings are employed in inlaying papier maché goods.

The growth of wool has, for several years past, been much attended to by the settlers, and New Zealand wool gradually becoming a valuable article of export. The New Zealand wool brought into the English market in 1857 amounted to 8,325 bales.

One friend of mine wrote to me some time back, saying, "I have recently had a long walking journey, about 50 miles, from Banks' Peninsula (whither I had gone in a schooner) home again to the neighbourhood of Otako. The journey was laborious. During the tour I passed along one of the most extensive grass plains in New Zealand. I suppose, from all I can learn, it is about 250 miles long and 30 miles wide; not a tree to be seen for miles, except the Ti tree. I walked about 150 miles of it, and had to depend upon drift wood for fuel. The country in this neighbourhood is mountainous; the soil is principally grass; very little fern." In the North Island, which is much more heavily timbered, the cleared lands have been devoted to the growth of cereals rather than to the feeding of sheep, but, in a letter of the 30th September, 1857, I find Ahuriri reported to be the finest of all the sheep districts of the colony, and that the people are wealthy, and their profits every year increasing with the growth of their flocks.

As a very large portion of the produce of New Zealand is sent to Sydney, either for Australian consumption, or to be re-exported to England, this filtration of its exports through another market before reaching England prevents our having a clear idea of the extent of its capabilities.

I may observe that in those districts which abound in fern, and are not, therefore, so suitable for sheep farming, large pig runs would form profitable sources of income to the farmers, no food producing finer grained meat than fern root, which, moreover, has this advantage, that it does not require any care in the cultivation.

At one time New Zealand pork was in low repute in New South Wales, as being gross and rank. This was,

* The shell is the 16th part of an inch thick. A hole is drilled in the end of it, and the egg must evidently have been contained of great value, as it was found deposited at the head of a skeleton, with a large number of *Poromus* eggs.

no doubt, owing to the circumstance that the principal portion of the salted pork sent thither came from the whaling stations on the coast, where the animals had been fattened on whale refuse, but fern fed pork is deliciously sweet.

Large numbers of cattle are being imported for stock, and already New Zealand hides are beginning to appear in the English market.

VEGETABLE PRODUCTIONS.

New Zealand possesses several ornamental woods, very suitable for cabinet makers' use, but probably the freight to England is prohibitory of their employment here; there are also some excellent timber trees for ship-building, such as the Puriri, a durable, hard wood, well adapted for knees. Of sixteen specimens sent to Sydney and experimented upon by Captain Ward, of the Royal Engineers, only one was lower in the breaking strain than English elm, fifteen were superior to that timber; several were nearly equal to the best English oak, and two ranked considerably above that wood; one is reported to be represented by a strain of 3001, superior English oak standing at 2037 to 2261 by the same formula.

The forests in the North Island furnish housebuilding timber of various sorts; amongst these the Kauri pine, whose habitat is now the north part of the North Island, although there is no doubt that it once existed in the southern regions. The freight precludes its being profitably brought to this country for housebuilding purposes, otherwise its fine grain, smooth working, and freedom from knots, would soon cause it to take a high position. Its value for ships' masts and bowsprits has long been recognised by the British Government, and many cargoes have been imported; beautiful arrow-like specimens, from 70 to 100 feet in length, tapering from 36 to 40 inches square at the butt to 18 inches square at the head, are not unfrequent, and pieces 50 and 60 feet and upwards in length, without knots, are quite common, and shorter massive bowsprit pieces are easily procurable.

The Kaipara and Hokianga on the west coast, Mercury Bay, the Thames and Wangaroa Harbours on the east coast, are the places in most repute for spars.

From the pine exudes a resin, known as Kauri gum, of which very large quantities are exported yearly. When it first oozes from the tree it is transparent, or at most milky, but exposure to the atmosphere imparts a yellow hue. This resin is not only obtained from the present forests, but is dug from ground where the trees from which it flowed have long ceased to exist. It is used in America in lieu of copal varnish. In this country, I believe, it is chiefly employed as a glaze for calico. The price in England varies much, having been as low as 15s. or 16s., and as high as 80s. per cwt.

All cereals thrive well in New Zealand, and large quantities of wheat and maize are annually produced and exported to the Australian colonies.

Our ordinary fruit trees furnish their ample stores to the southern cultivator, and as we advance northwards, delicious water melons, Cape gooseberries, figs and oranges thrive in the open air, for there an ever-fresh verdure prevails, and the last year's leaves, in a green old age, gradually retire in spring before their more vigorous successors. Some French settlers at Akaroa, in Banks' Peninsula, Middle Island, are cultivating the vine successfully, and in the North Island many varieties have been introduced, principally through the agency of Mr. Busby, who devoted much time and took great interest in the subject. Potatoes and kumeras (a sweet potato, which is at first rather mawkish to the European taste, but in a short time becomes pleasant, and a favourite vegetable) are the staple articles of native food, and these are grown in vast quantities for sale, and ship-loads of potatoes in the season are forwarded to Port Phillip and Sydney. It has already been noticed, that

the maize and potato flourish side by side in this antipodal Britain.

The *Phormium tenax* (New Zealand flax) is a hardy plant, belonging to the natural order of lilyworts; and although popularly termed flax, the plant from which it is obtained differs entirely, and in almost every respect, except that it is a plant, from the European flax and hemp. The following Table, showing the botanical differences, may render this statement more plain:—

	Class.	Order.	
European flax...	Exogens ...	1*	{ Fibre from the stem of the plant. Fibre from the stem of the plant. Fibre from the leaf of the plant.
„ hemp	Exogens ...	2†	
New Zealand flax	Endogens ...	3‡	

There are several varieties, some yielding finer, others coarser fibres, and but little care has hitherto been given to the selection of the most suitable for manufacturing purposes in England, but if the difficulties of preparing large quantities could once be overcome, and attention drawn to the necessity and advantage of selection, the cultivation of the superior kinds only would be encouraged.

Warmth and moisture appear to be the principal requisites for its flourishing. In New Zealand it grows on the hills and in the valleys, but seems to thrive best in the latter situation.

In the *Gardener's Chronicle* of the 12th December 1857, Mr. Saunders, of Jersey, states that he has a plant of the *Phormium tenax* which, in 1855, produced one flower stem 10 feet long; in 1856, ten flower stems averaging the same length, and in 1857, seven flower stems of the same length, the diminution owing to deductions having been made from it for the purposes of propagation. The position was moist, and exposed, with a westerly aspect. "The leaves," he says, "vary from five to eight feet in length, and we sometimes strip them off and make use of them as tyres, which are particularly tough and strong. If these leaves are kept for two or three years, they may at any time be made pliable by steeping in water, and made as useful as if they had been taken from the plant but a few days."

The New Zealanders use it green in strips for tying and joining in every shape, the article being a convenient substitute for nails, string, pins, and all connecting implements, and in its green state it is also used largely for plaiting baskets to hold potatoes, and cooked food is generally presented to chiefs and visitors in new flax baskets, about the size of a mechanics' paper cap. When prepared it is used in the manufacture of all kinds of garments, in the making of lines for fishing, ornamental baskets for small wares, and floor mats. It is sometimes dyed of various colours to confer additional beauty on the articles into which it is manufactured.

The native mode of separating the fibres from the dense mass of fleshy parenchymatous matter in which they are embedded is by means of a cockle-shell, and by a gentle pressure the shell is repeatedly drawn or combed along the leaf, and gradually the fibres appear in long and beautiful delicate silky threads. Doubtless,

this is not an economical mode of preparation, a large per centage of really valuable fibre being combed away and discarded, but no European mode of proceeding has hitherto been found to accomplish the object so successfully.

I may explain that the old careful preparation of flax by the natives is almost dying out; they can obtain European good clothing at so cheap a rate, and their time can be employed to so much greater advantage in other pursuits. Several European plans have been tried, but none as yet have been attended with any marked success.

A friend of mine, writing from Auckland, on the 30th September last, says, "I am afraid nothing will come of Whytlaw's flax. Five tons in six months will not pay his staff of men and boys, but I think we shall have some flax ere long to export;" and then he refers me to some specimens prepared by the Baron de Thierry's process of steaming.

Another Auckland resident, Mr. Cox, appears to have been trying his skill in preparing the flax for manufacture and exportation. It is stated that the machine is very simple, being based on the principle of the carding machine. A subscription was at once started to cover the expense of preparing five tons of flax for shipment to England; it is also stated that the natives present at the trial of the machine wanted to purchase it on the spot. On this occasion, the motive power was by hand-labour, but even this showed a result of 3 cwt. per frame or machine per day, and with steam power there would be nothing to prevent a hundred frames or machines being set at work under one roof. This experiment was made in the presence of several of the most influential colonists, who, on the same occasion, entered into a subscription for defraying the expenses of a public trial of the Baron de Thierry's mode of preparing flax. I also learn by recent news from Auckland, that nearly £1,600 has been subscribed towards the formation of a flax company.

So important has this question been deemed by the Colonial Government of New Zealand, that it notified on the 20th Dec., 1856, that the following rewards would be paid for certain inventions or improvements connected with this article,* viz. :—

£2,000 to the person who shall, by some process of his own invention, first produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, 100 tons of merchandize.

£1,000 to any person, other than the person entitled to the first reward, who shall by some process of his own invention, next produce from the *Phormium Tenax*, or other plant indigenous to New Zealand, 100 tons of merchandize.

£1,000, viz., £200 to each of the first five persons, other than those entitled to the first and second rewards, who shall by any process, whether his own invention or not, produce from the *Phormium Tenax*, or other fibrous plant indigenous to New Zealand, 25 tons of merchandize.

Half the reward to be paid upon the Governor being satisfied that the applicant is entitled to the same, and the other half on proof of the *bond fide* sale of the merchandize in Europe, at an advance of 20 per cent. on the actual cost of the article landed in Europe. Every claim for reward to be preferred before the 1st January, 1859.

The importance of this subject to the mother country will be apparent, from a consideration of the immense quantities of flax and hemp imported yearly into England. These were—

FLAX, DRESSED AND UNDRESSED.

Quantity in 1855.	Value in 1855.	Quantity in 1856.	Value in 1856.
1,293,435 cwts.	£3,317,122	1,687,041 cwts.	£3,627,607

* See *Journal*, Vol. V., p. 328., and Vol. VI., p. 137.

* 1. European flax (*Hypogynous exogens*), geranial alliance. Symmetrical flowers; styles distinct; seeds with little or no albumen.

† 2. European hemp (*Diclinous exogens*), urtical alliance. No albumen; unsexual.

‡ 3. New Zealand flax (*Endogens*), lily alliance. Styles consolidated; hypogynous, bisexual, hexapetaloid; copious albumen.

HEMP, UNDRESSED.

Quantity in 1855.	Value in 1855.	Quantity in 1856.	Value in 1856.
1,274,678 cwts.	£1,918,816	1,504,726 cwts.	£1,935,873

And yet one of our own colonies produces an inexhaustible supply of an article which, according to Dr. Lindley, is stronger than those so largely consumed materials, the comparative strength of various fibres being thus stated by him:—

Silk	34
New Zealand Flax	234
European Hemp	16½
European Flax	11½

I must add that, although the flax is admitted to be exceedingly strong in the straight pull, it is stated to cut in the tie; whether this arises from a serrated edge of the fibre, or from a brittleness produced by the presence of the gum and chemical salts, as phosphate of lime, &c., which the flax naturally contains, further experiments can alone determine. Certainly the flax imported during the last 15 years cannot be regarded as fairly representing what the article is, so rough and unprepared have been most of the specimens I have seen.

The plant contains a curious gum, of which I had a sample sent over for the purposes of experiment, but so anxious were our customs officers to ascertain whether it contained a liquid liable to duty, that the bottle was broken in the process of ascertaining the point, and the contents spoiled.

MINERALS.

COAL.—This valuable substance has been found cropping out in various parts of the country, in some of the southern parts of the North Island, also in the provinces of Nelson and Canterbury. It is being worked on the surface, I understand, but the quality is not, so far as I can learn, of any very great excellence.

COPPER.—A considerable quantity of copper ore has, at various times, been imported from New Zealand, principally by way of Sydney, obtained from the Great Barrier Island. I believe the works are not being carried on, whether from the yield not being satisfactory to the proprietors, or from any other cause, I am not aware.

The Dun Mountain Company propose mining in the province of Nelson. Two tons of ore extracted from the lodes they propose to work, were dressed for market at Swansea. This parcel is stated to have yielded, after dressing, 23½ per cent. of fine copper, and the refuse dust produced 6½ to 13½ per ton of ore, which consists of a grey sulphuret, with red and black oxyde and native copper, and strong yellow sulphuret. A staff of miners, with suitable implements for carrying on the works, have been despatched to Nelson, and, by this time, are expected to be at work.

GOLD.—The sudden elevated position taken by Victoria on the fact of its gold fields becoming known, naturally led the neighbouring colonies to look at home, and, if I may so say, "sweep diligently the house." In Van Diemen's Land gold was discovered, although not in sufficiently remunerative quantity, and New Zealand soon proved that it also possessed the precious metal.

The Coromandel Harbour was the first district which the colonists ascertained to contain gold, but, although a large reward was offered by the Auckland merchants for proof of its affording a reasonable compensation to diggers, the necessary evidence to secure the reward was never forthcoming. The province of Nelson, however, in this matter, as in the case of copper, seems likely to claim the palm. Already 2,000 diggers are diligently at work devoting themselves to the search for gold, and have agreed to regulations amongst themselves. Their search appears so satisfactory that many are leaving the other provinces to join in the gold hunt.

DIVISION INTO PROVINCES.

By an Act of Parliament, 15 and 16 Vic., cap. 72, a constitution was granted to the colony, the legislative powers being vested in a General Assembly, consisting of the Governor, and Legislative Council and House of Representatives, for the whole colony; the minor local affairs of the six provinces into which the islands were divided being placed under the management of a Superintendent and Provincial Council for each. These provinces are Auckland, New Plymouth, and Wellington in the North Island, Nelson, Canterbury and Otago in the South Island.

The North Island, as has been stated, contains a comparatively large native population, which circumstance, although advantageous in some respects, from other points of view has its difficulties. Labour is thereby more easily obtained than in an unpeopled country, and in the natives we have a very large productive and consuming power, all desirable in a commercial aspect of the question. As a simple but pregnant illustration of the importance of the native element in all considerations affecting the three northern provinces, especially Auckland, I may state, that in the year 1855, the vessels registered at, or belonging to, Auckland, consisted of three steamers, 41 foreign going vessels, of 6,618 gross tonnage, 75 coasters belonging to English owners, 49 coasters belonging to native owners, besides which there were 158 small craft, averaging 10 tons, of which 34 belonged to native owners. Innumerable squadrons of canoes, from 10 to 70 feet in length, some capable of carrying many tons of produce and sixty or seventy persons, are not included in this account. These vessels may probably bear about the same relation and importance to the other properties and operations of the natives, whether of farming or dealing, as in other countries.

Yet it was in reference to men capable of this development, that a Committee of the House of Commons passed a resolution to deprive them of all waste lands not actually occupied; contrary to the express agreement of her Majesty's Representative with the chiefs, in the hearing of myself and many other Europeans.

The resolution was not carried out, and the natives remain the proprietors of the land in the North Island, except so much as, in accordance with the Waitangi treaty, may have been purchased from them by the government, and hence those extensive districts are not open to the occupation of Europeans, as is the case in the Middle Island, where the native population being extremely small, there is a more free field for European colonization.

The northern province is Auckland, at present the most important, being the seat of government, and having the largest European and native population. The numerous rivers in this province have caused a considerable coasting trade to spring up, and about a thousand vessels, including coasting craft from 10 tons and upwards, enter the port of Auckland yearly. Small farms are easily obtainable, with good soil and healthy climate, and the means of comfortable living are procured with such facility, that an old resident has said,—"A working man thinks it hard if he cannot have meat on his table three times a day, and further adds, "A beggar would be a novelty." A friend, who has lived in different parts of the islands, both in the extreme north and in the south for twenty years, and who resided in the New Plymouth District for several years, says,—"Taranaki is decidedly one of the finest districts, the land being so excellent, but there is no harbour, and the roadstead is dangerous." And Governor Grey says, "I have never in any part of the world seen such extensive tracts of fertile and unoccupied land as at Taranaki." On the whole, this province justifies the high praise the natives have ever bestowed upon Taranaki as being the choice garden of the island. It is more suitable for agricultural than pastoral pursuits, and for small farmers is not surpassed by any other.

SKETCH MAP OF
NEW ZEALAND.



LAND.—The following will, I believe, be found a tolerably correct account of the various modes of obtaining land in New Zealand.

AUCKLAND.—Town, Suburban, and Rural.—These are sold by auction, at an upset price fixed by the Waste Land Board.

Occupation Land.—On payment of a deposit of 1s. per acre any person may receive an order for not less than 40 and not more than 100 acres, and occupation is granted immediately on a lease for five years at a yearly rent of 6d. per acre, the deposit being the payment for the first two years' rent. After five years bona fide occupation and payment of all rent, a grant from the Crown is issued on payment of 1s. per acre. **General Country Lands.**—These may be acquired in lots of not less than 40 acres, on immediate payment of 10s. per acre.

Pasture Licences for 14 years are obtainable by payment of an annual fee of £5, with an assessment of £1 for every thousand acres above 5,000 which the run can carry. **New Plymouth, Wellington, and Nelson** are not very dissimilar in their land arrangements.

OTAGO.—Town lands are sold by auction. Rural lands are obtainable at 10s. per acre, subject to the condition of expending in labour for all improvements within 4 years, a sum equal to 40s. per acre. Pasture licences, annual fee 25s. and £1 for every 100 acres.

STEWART.—Town lands by auction. Rural lands, 40s. per acre. Pasture licences, £1 per 100 acres.

on the globe. Taranaki is the native name for the district of New Plymouth.

Wellington and Nelson were founded by the New Zealand Company, and after many vicissitudes and troubles from various causes, are gradually rising to wealth and importance. Sheep farming has been extended, and the export of wool is assuming large proportions.

Of late gold has been discovered in the province of Nelson, and some settlers, I find, are leaving Auckland for the gold district. There has not been sufficient time to test the value of the diggings, and I trust they will not be so encouraging as to draw off the colonists from the steady pursuit of the more certain, though more slow, rewards of agriculture. For, however successful gold diggers may be, they are consuming capital as well as interest, whereas, in farming or sheep-breeding, generally speaking, more is yearly left on than is removed from the land, and in this view I am not certain whether, if all the gold diggers had devoted themselves with equal energy to ploughing and sheep and stock breeding, they would not have been quite as rich on the whole as they now are. Still there are "high pressures" among us to whom the exciting digging life is the most suitable industry, and to whom the humdrum round of farming and sheep-keeping would be unendurable, and so we wish them God-speed.

Canterbury and Otago are rapidly advancing to affluence, these provinces being eminently adapted for pastoral pursuits.

The gentleman to whom I previously alluded writes to me in reference to this part of the country: "The country generally is well adapted for sheep and cattle runs (my friend came from an English grazing country), also very good for cultivation, and I have little doubt but that when these settlements are fairly set going, they will soon be flourishing, especially for the grazier. The climate is much the same as some of the south parts of England, and appears to be healthy for European constitutions; the health of ourselves and family has been better here than it has been since we left England."

EMIGRATION.

To intending emigrants I would point out New Zealand as offering to industry, easy competence, gradual improvement, and eventual affluence; not so rapidly, perhaps, as in some other colonies, but without their drawbacks. If you are farmers, and a good productive soil and delightful climate be your desire, then gratify your wishes by settling in the northern provinces; if to be rich in cattle and sheep be your ambition, seek its accomplishment in the southern provinces. If hale and strong, you have nothing to fear from the vicissitudes of the seasons, for to Englishmen the provinces are all mild; if delicate, seek the retention or restoration of health by settling in the northern provinces. If mechanics, you will probably find a larger sphere in the more peopled districts, as at Auckland, Wellington, or Nelson. But whatever your purpose, or whichever place you may select, go with a resolute brave heart, determined to stay, to spend your life in your adopted country. Leave nothing behind, but, converting all your properties into cash, remit the money through one of the two respectable banks which have branches in New Zealand, either the Union Bank of Australia, or the Oriental Bank Corporation. Carry nothing with you save a good stock of personal apparel, and under no circumstances whatever be persuaded to burden yourselves with furniture, except a chest of drawers, and still less be coaxed into the purchase of goods for sale, for recollect there are always supplies in Sydney ready to be poured into the New Zealand market within a few weeks of the special want arising; besides that, the merchants at all the principal ports have correspondents in England, who are only too ready, by the very first opportunity, to supply, in any quantity, whatever may be required. By the possession of cash, you would be enabled,

in many cases, to purchase advantageously farms upon which much labour had been expended, the occupants desiring to remove, to retire altogether, to enter upon some other business, or leave the colony, and in arranging with such, the circumstance of receiving immediate cash is a great consideration. Nor is it of trifling importance that you should enter upon a partially cleared and ready tilled farm, rather than undergo the tedious hard labour of commencing everything anew for yourselves,—only those whose eyes have swept over miles and miles of forest and fern for days together, can appreciate the hope and joy that spring up at the sight of a little cultivated patch, however small, even a few yards square.

COMMUNICATIONS WITH THIS COUNTRY.

Nor inspeaking thus of the emigrant proposing to himself a final farewell of his native land, I do not at all discourage the idea of his often communicating with the dear old country; so frequently do the opportunities now occur that one can no longer expect a settler to jump for joy at a letter from home, and read with avidity, and interest next to his bible, an old newspaper from England.

It is less than twenty years since the first merchant ships began to sail regularly direct from England to New Zealand; previous to that date, the circuitous route of sending goods to Sydney, where they waited an uncertain time for a small vessel to convey them to New Zealand, was the only course possible. Vessels of considerable size now depart about once a fortnight to one or other of the chief ports, and so direct communication one way, outward, is tolerably frequent, but the export trade has not yet enabled us to have any regular communication from New Zealand; letters still come by way of the Australian colonies.

When the Peninsular and Oriental Company ran their steamers to Sydney with the English mails, correspondence with New Zealand was regular, the New Zealand government having subsidized a steamer to run monthly in conjunction with that line. On the removal of the steamers at the time of the Crimean war, the communications became extremely irregular, the arrival of the outward mail from England being uncertain, inasmuch as letters were sent from this country by sailing vessels to Melbourne, whence they were transmitted by a steamer to Sydney, and thence forwarded on to New Zealand by the contract steamer *William Denny*. On the new Australian contract being taken, it was hoped that regularity would become the rule, but we have been doomed to miserable disappointments; almost on the first voyage, under the new arrangement, the inter-colonial steamer was wrecked near the North Cape, and has not yet been replaced, therefore intelligence has at present to be conveyed to and from Sydney and New Zealand in sailing vessels, and when thus far on their journey, the irregularity in arriving and departure, and the utter inefficiency of the new Australian mail service, render all calculations unavailing. No one should just at present reckon upon his letters until actually in possession.

A brighter prospect is, however, opening before the colonists in this respect—the Royal Mail Company having entered into an arrangement by which, in the course of a year or so, a monthly communication, by way of Panama, will be opened between this country and New Zealand; a line of steamers will be placed on the Pacific to run in conjunction with the West India vessels. As New Zealand will be their first port of arrival in the Colonies, and the last of departure, the intercourse will be altogether different from the present, and as this line will be in addition to the Eastern mail line, we may thus hope to have a fortnightly service, and when the submarine telegraph system shall have laid its girdle round the earth, I do not despair of the possibility, in the lifetime of some present, of our being able to pay a bodily visit to our antipodal friends in 40 days, and to flash the thought divine in 40 minutes.

DISCUSSION.

Mr. P. L. SIMMONDS said, the subject which had been so clearly and connectedly brought before the members by Mr. Stones, was a very important one in view of the emigration which was daily taking place, and it had been presented free from all bias or undue partiality. Having for a long series of years paid a special degree of attention to the British Colonies and their resources, and New Zealand having recently been prominently before him, he might add some corroborative opinions to those advanced by Mr. Stones. Firstly, however, he would remark that he was delighted to find the Council paying a due proportion of attention, among numerous other subjects, to colonial interests—for the programme of papers to be read contained several—and the discussions upon these were calculated to benefit home interests, as well as the colonies themselves. Only that very morning he had been looking through a series of interesting New Zealand specimens sent him by his brother, a paymaster in the Navy, who had recently returned from that colony, and who spoke highly of the climate and capabilities of the New Zealand group, and that from an experience of several years, while attached to H.M.S. *Pandora*, surveying the New Zealand shores. Only a week or two ago also, in a business letter he had received from a correspondent at Auckland, dated Oct. 28, occurred these words:—"I have been ranging the colonies. After leaving Van Diemen's Land I was for nearly four years a resident in Sydney, visiting Adelaide, Melbourne, Wellington, and other places. I am now, I incline to think, finally settled in Auckland, where, thank God, I have been for the last nine years, sound and hearty as ever, and here I am likely to become a fixture. I consider New Zealand the flower of all the colonies, and I am happy to say I have not been unsuccessful in founding a home in her." When they considered that New Zealand was almost the youngest of Britain's colonies, her present position was a remarkable evidence of industrial progress, achieved, too, in the face of many adverse difficulties, despite the pet colonizing projects and schemes which had been carried to a certain extent and then dropped. But the indomitable energy of the settlers, thrown upon their own resources, with the natural advantages of a good climate, ample room for extension and progress, and steady perseverance, had achieved a present success which would compare favourably with any other British possession. When it was remembered that it was scarcely 17 years ago that the first settlements there were formed, with all the counter attractions of the Australian gold fields, and with the disadvantage of a long and expensive passage, which induced many thousands yearly to take the shorter voyage across the Atlantic, we yet found a European population of 40,000 settled in New Zealand, six distinct settlements formed on the Northern and Middle Islands, and flourishing towns dotting the coasts on either side from south to north. The revenues of New Zealand now amounted to nearly a quarter of a million; her customs duties bringing in £100,000, and her land fund about £80,000 to £90,000. And it was extremely satisfactory to find that the land was now open to the selection of small settlers at a reasonable price, instead of being only available at exorbitant rates in large blocks, as was formerly the case. While the Canterbury Company fixed the price of land at £2 and £3 per acre, land could now be had for 10s. an acre, and from the judicious arrangements of the provincial governments, a remission of the passage money, or, at all events, a commensurate allowance in land, was in many instances being made. He held in his hand an official announcement from the Immigration Department of the province of Wellington, dated the 11th August, by which it was notified that every immigrant would be entitled to receive ten acres of land for every £20 he should have paid on account of the passage of himself and family. Now this was a boon calculated to counteract, in some

degree, the partiality evinced for Canada, where free grants of land were given to settlers in some districts, but in a much more severe climate. Although, as was remarked by Mr. Stones, the principal portion of the New Zealand trade was an inter-colonial one, and she sent large supplies of timber, agricultural produce, &c., for transhipment or for local consumption to the Australian ports, still we found that the value of the direct imports from New Zealand in 1856 were about £101,000, and the shipments of British produce and manufactures and foreign goods thereto, from the United Kingdom, amounted to about £290,000 in value. Mr. Stones had incidentally mentioned most of the indigenous productions of the colony. He (Mr. Simmonds) believed, however, much yet remained to be done with many of these: her fibres, her minerals, her building and furniture-woods, her dyes and tanning substances, the Kauri gum, (of which she now shipped 20 or 30 tons) and other produce, if not for export at least for local use and manufactures. With respect to her gold fields, injurious as these were, to some extent, as distracting attention from more settled industrial pursuits, still this disadvantage was counterbalanced by the thousands of restless spirits which they drew from other quarters, and who mostly settled down eventually, when unsuccessful in gold-finding, to other pursuits. Looking at the present discoveries, and judging from the geological formation of the islands, which no doubt at one time formed part of the great Australian continent, it was very probable that more important auriferous deposits would yet be found. Even the two gold fields already being explored were by no means insignificant, since, from one field at Aorangi, the last steamer had brought 600 ounces to Nelson. But the extensive diffusion of gold through the Coromandel ranges, within 40 miles of the city of Auckland, appeared now to be established. Thus the Auckland *Weekly Register* of Oct. 5, in an article on the goldfields, active and passive, stated:—"Hundreds of ounces, under the greatest difficulties and discouragements, have been known to be obtained there; but who is there can tell the quantity that has been steadily and silently gathered by a few persevering hands? Samples upon samples of scale gold, and specimens after specimens of a sort of faun-coloured quartz, actually studded, not streaked, with the precious metal, have from time to time been exhibited. From eleven ounces of such quartz Mr. Vercoe obtained seven ounces of gold. Other experiments, by Mr. Keen and others, have not been less encouraging; and yet, with all these incentives, with all these challenges to dig and grow rich, Coromandel is still as much overlooked as if her ridges bore nothing more precious than scoria or pumice-stone! These remarks have been drawn from us in consequence of a further and remarkable authentication of the great riches of Coromandel by the receipt (by the *Maid of the Mill*) of some beautiful specimens of quartz completely impregnated with the shining metal. We have the authority of gentlemen fully informed on the subject, for stating that this quartz was broken off a vast mass of the same material now in process of being crushed. This, we think, is one very sufficient reason why the Coromandel gold fields should no longer be suffered to remain unproductive." Another Auckland paper, the *New Zealander*, of Oct. 14, stated, with respect to Coromandel gold, "Mr. W. Wilson, whom many of our readers may remember as formerly in business as a baker in this city, and who resided for seven or eight years in California, has this day brought for our inspection a fine sample of gold, which he has just obtained in the neighbourhood of Messrs. Roe and Street's saw mill. He further states that in the course of a hasty prospecting visit, he saw enough to convince him of the richness of this neglected gold-field, which he considers quite equal to anything he met with during his stay in California, where, for five years, he was constantly at the diggings." The other provinces were put on their mettle by these discoveries, for at Otago a public meeting had

been held to provide, if possible, a counter attraction in the form of a remunerative gold field, so as to prevent the departure of the new immigrants arriving, and it was broadly asserted in the resolutions that "the existence of gold in certain districts of the province is a well-ascertained fact, and it therefore behoves the provincial government to take active and immediate steps for ascertaining the localities where its working would prove remunerative." Passing next to its principal staple, the wool shipments, we found that, while only 487 bales were shipped from New Zealand in 1849, our imports thence in 1857 reached 8,325 bales. It was stated by one of the members, in a Wellington paper, that that province, out of its 10,000,000 acres, had about 4 or 5 millions fit for pasturage in their natural state, and these, at the rate of 1 sheep to 3 acres would yield 13,000 bales annually, worth about £200,000. If improved and cultivated, however, the pasturage would probably feed 6 sheep to the acre. But this was only one district. The province of Auckland could not be surpassed as a wool growing district, either as to quality or quantity from each sheep. One of the first wool-brokers in the City had remarked, that when the first specimen of New Zealand wool was brought to him by some gentleman unknown, without saying whence it came, and his opinion being asked of it; after examining it carefully, he replied, "Whatever country that wool comes from must be a sheep's paradise." He had since stated that there were some peculiar and very valuable qualities in the best New Zealand fleeces, and as for strength of fibre, it was "as tough as their native flax." He would say nothing as to hides, cattle, and other agricultural produce, but he was glad to notice that the Chinese and African sugar grasses (species of *Holcus*) had been introduced, and their cultivation might possibly be attended with beneficial results, and lead to the production of sugar for local consumption. These grasses, which had been introduced largely of late into Europe, Canada, and the United States by his friend Mr. Leonard Wray, a Natal colonist, possessed these beneficial properties, that they would ripen and yield sugar in temperate climates, and come to maturity in three or four months, whereas the sugar-cane took twelve months or more before it yielded a crop. There was one index which afforded a better criterion than almost anything else of the position and prospects of a colony, and that was the nature of its newspaper press. Receiving as he did, regularly, all the New Zealand journals, he learnt more of their condition and progress, their wants and grievances, than could be gleaned elsewhere. Now, when he told them that there were 18 or 20 newspapers now published in the New Zealand islands, newspapers, most of which would do no discredit to the metropolis or the large provincial towns, whether as regarded their typography, paper, or conduct, this was a remarkable index of progress. Several of these papers were issued twice a-week, full of business advertisements, appearing at Dunedin, in Otago; at Lyttelton, in the Canterbury settlement; at Nelson and Wellington, in Cook's Straits; at Taranaki, in New Plymouth; at Wanganui; at Ahuriri, in Hawke's Bay; and at Auckland. Now, this was a state of things which compared favourably with any other British colony, and he could not but contrast it with the time when, in the infancy of the colony, a friend of his, who conducted a journal issuing from the Government printing-office at Auckland, had the permission to print there withdrawn, owing to the freedom of his remarks against the Executive, and after collecting all the stray type that could be obtained, was driven to the shift of printing his paper by means of a mangle, as there was no other press in the colony. He (Mr. Simmonds) had laid copies of all the principal New Zealand journals on the table, and the members and visitors who were not in the habit of seeing those colonial papers, could form an opinion of their business character for themselves. He found he had already taken up a large share of their time, and as he saw present Mr. Ridgway, Mr. Sidney, and other gentlemen, who could

give them much valuable information, he would now give way to them.

Mr. Ridgway said although he had never been in New Zealand, yet he felt a deep interest in that colony, having been officially connected with it for a great number of years, and his name would be found in connection with its earliest establishment, particularly with regard to the province of Auckland. Mr. Stones, in his very able paper, had given them a rapid sketch of this rising colony, but there were some points of importance which he had omitted. First of all there were the questions which agitated, and, in fact, retarded the progress of the colony to a great extent. He alluded to the political discussions and the jealous contests between the provinces of Auckland and Wellington, as to which should be the seat of government. Peculiar circumstances tended to make Wellington a province, but he would appeal to the shippers to New Zealand whether the difference in the rates of insurance as between Wellington and Auckland was not a fact in favour of the latter. The port of Wellington had many disadvantages. The winds blowing through Cook's straits during the greater part of the year caused great difficulty in navigating them, and when vessels arrived at Wellington the landing was often difficult and dangerous, and they were also locked in. The high lands which surrounded Wellington prevented ready access to the interior. The timber in the neighbourhood of Auckland was extremely valuable, the trees growing to an enormous size. At the Paris Exhibition unfortunately there was no means of properly testing the quality of the timber sent, because the specimens were too small. The contributions from this colony were meagre in comparison with what they might have been had not the colonists considered themselves somewhat slighted at the Great Exhibition of 1851. With regard to the Coromandel gold fields, he was not sufficiently acquainted with the subject to be able to speak upon it, but his impression was that that district did not belong to the British crown, but still remained a part of the native possessions, and until it became British property it was not likely our people would expend much money in prospecting upon that place, though unquestionably there were valuable gold fields there. With regard to the article of coal, he had been assured that it existed in great abundance in New Zealand, but the great difficulty was in working it, on account of the scarcity of labour. From all he had heard it was of good quality, and it was well known that the lower they worked for coal the better the quality was. With reference to the Kauri gum, it was a valuable production, in great plenty in the colony. With regard to the facilities for exporting products from New Zealand, they were not so great as those which were possessed by other and less remote colonies, inasmuch as the ships which took out emigrants went to China or India for their return cargoes. Reverting to the subject of the scarcity of labour in the colony, he was happy to say that he had recently despatched by the ship *Egmont*, 60 or 70 labourers, promising men, of good character; and the advantages of emigration to Auckland consisted in the arrangements of the provincial government, of which he (Mr. Ridgway) was the agent, who paid one-half of the expenses of the emigrant's passage, leaving him to pay the other half six months after his arrival in the colony. It was a mistake to pour in large numbers of emigrants all at once. They had instances of 6,000 or 7,000 emigrants being poured into Melbourne in the course of one week, and under such circumstances it was impossible but that the labour market should be overstocked, and hence much disappointment and misery resulted. Whilst speaking of Auckland as possessing undoubted claims to the seat of the government, he would refer to Nelson, Otago, and other places in the colony, as being most desirable for those who went out with large families. The most important point, perhaps, in connection with this subject was the

means of regular and speedy communication with our Australian colonies, especially by way of New Zealand. He had always contended that the Panama route, by way of New Zealand, was the right one. With reference to the sale of land in our colonies, in his opinion the disposal of it in small allotments was of the greatest advantage to the emigrant, because it prevented jobbery in land. Every one could obtain small plots of land in New Zealand at 10s. an acre. The government bought it at about 7d. per acre, or even less for large blocks, and the profit made by the sale of the land went to help poor persons in their passage to that colony, and thus employment was given to our ships, and markets were created for our home manufactures.

Mr. WILLIAM HAWES said it appeared to him that the most important part of the paper was the placing before them, in well-arranged and consecutive form, information which would enable intending settlers to determine which of our many colonies they would select. The great point was to know whether particular colonies were capable of producing those commodities which were in greatest demand at home, and then they could select the destination which appeared to hold out the greatest chances of benefit to themselves and their families. The great staple productions of New Zealand might be regarded as timber, wool, and gold, and to these this country would attach greater importance than to any others. He could not go to the extent of saying that gold digging ought to be deprecated, for who could say what would have been the position of the commerce of the world in general had not our supply of gold been largely increased by the discovery of the gold in Australia and California? Therefore, let them not deprecate the search for gold on the ground that it ate up capital. Labour was given in exchange for gold, and the gold was exchanged for the manufactures of this country, and a beneficial system was thus established. It was quite clear that the object of the paper that evening was to prove that New Zealand offered greater advantages to settlers than any other colony. Whether it would be successful in that he could not say, but it could not be denied that much valuable information was given, which would greatly help in deciding the question as to the quarter which one would choose as his ultimate destination, and it might be a question with many whether New Zealand had not great claims for preference over many other colonies that had up to the present time been more highly favoured.

Mr. SAMUEL SIDNEY said that in the course of the many years that he had devoted his attention to colonization, he had never heard a paper on the subject of New Zealand which was so full in its details and, at the same time, so free from the exaggerations which had hitherto almost invariably characterised everything written or spoken by the friends of that interesting colony. New Zealand afforded a striking example of a colony spoiled by overpraise, over-regulation, and over-legislation. It reminded him of the child of the anxious mother overwhelmed with tutors and doctors, and yet, with all her pains, neither clever nor healthy, and on appealing to a woman of common sense, she recommended the trial of "a little healthy neglect." Twenty years had elapsed since the colonization by the great defunct company at one end, and the Government at the other, commenced; until the company fortunately became bankrupt, and the government, about the same time, allowed colonists to manage their own affairs. New Zealand was the subject of a series of experiments in colonization, each more disastrous to the colonists and more costly to the mother country than the last. Models of colonization were promised in Wellington, in Nelson, in New Plymouth, in Otago, and in Canterbury, examples of slices of English civilized society, capitalist squires, respectful and cheap labourers concentrated round cities, with churches, schools, colleges, and macadamized roads. But all had ended in the ruin of the emigrants, who only began to succeed

when they followed the example of unsystematic colonists, and allowed labouring men to cultivate cheap plots of land, while men of money betook themselves to dispersion and sheep-feeding. He had calculated that as much money had been spent in Blue Books, Naval Books, Reports, &c., on New Zealand, as would have paid the whole cost of governing Port Philip up to the time that gold digging commenced there. The successful colonization of New Zealand, described so effectively by Mr. Stones, had been worked out by those who, disappointed or ruined, could not or would not return, and, therefore, with a true Anglo Saxon spirit set to work with the happy results which they had had the satisfaction of hearing that evening. Ten years ago (the last time in 1850, at the great meeting of the Canterbury colonists) he (Mr. Sidney) had contended, in opposition to many influential men, that only on a low-price system of land allotment could New Zealand flourish, and now he had the satisfaction of finding that the local legislature had been forced to repeal the laws of the English parliament and the rules of the New Zealand Company, and adopt his once unpopular view. Having said thus much by way of preamble, he would venture, in the most friendly spirit, to dissent from two or three of the opinions that had been laid down that evening. Mr. Stones had very modestly referred to all the productions of New Zealand with the exception of the great staple wool; to that he appeared very wisely to give the palm of importance. He had suggested that emigrants of small means and strong arms should apply themselves to the cultivation of the not very expensive or accessible parts of the naturally fertile soil, while those of large means should direct their attention to pastoral pursuits. His friend, Mr. Simmonds (of whose zeal in placing before the public the raw productions of various quarters of the globe it was impossible to speak too highly), had been, he thought, a little too enthusiastic in the stress he had laid upon the manufacturing and mining products of New Zealand. He (Mr. Sidney) thought, in the course of time, New Zealand colonists, with more capital at command than they had at present, or were likely to have for twenty years, might discover some mode of turning native flax to profitable account; but he would warn those who thought of emigrating to that colony not to turn their attention to flax manufacture, unless they were prepared to sink a great part of their capital—for this flax had occupied the attention of colonists for the last 20 years. During that time a vast amount of money had been spent upon it, without the slightest commercial success, and a colony was not a place for the scientific experiments of capitalists or amateurs. The first business of a colonist was to make sure of a livelihood by the staple pursuits of the colony, not to indulge in speculations, either in flax or copper mines, or veneered woods. With regard to copper ore, success depended upon the facilities for raising it. When South Australia was on the point of ruin, the Burra-burra mines were discovered, and saved the colony, but following that discovery there were no fewer than 97 other mines, of which not more than two had ever paid a shilling of dividend. The remarks he had made with regard to metallic ores applied with equal force to the woods of the colony. The wood was very pretty, and it might answer the purpose of a single cabinet maker in London to import a few logs or roots, but there was scarcely a quarter of the globe in which equally beautiful woods were not to be found; it was, however, found that it would not answer to bring them into competition with the rosewood and mahogany, which were obtained at so much less cost of labour and of freight. With regard to the awards of medals at exhibitions, he did not attach much importance to them; commercial demand was the best and surest reward for commercial producers. He advised those who thought of colonizing to turn their attention to pursuits which would put bread into their own and their children's

mouths. He did not, with Mr. Simmonds, anticipate any competition between the two colonies in the growing of wool, because the demand for that article was so great that manufacturers could consume the wool of a dozen purely pastoral colonies. But he would also warn intending emigrants against the idea that, whereas without cultivation they could feed three sheep per acre, with cultivation they could feed six sheep per acre. Those were statements, he apprehended, taken from New Zealand handbooks. The fact was that the land best adapted for sheep feeding was just that which was not fit for cultivation. Root cultivation on English principles was impossible with New Zealand prices of labour. The great profits derived from sheep feeding consisted in the fact that the animals were able to get their own living, with a comparatively small expense for shepherding. He agreed in the statement that those who emigrated to these colonies should go to settle if they meant to succeed, but he thought, too, that in the present day, the mass of the people understood emigration quite as well as those who intended to instruct them. As for the colonists, they might perhaps make mistakes in legislation, as we had done, but they were competent to work out a suitable government, and he doubted not that New Zealand would take up a creditable and successful position among the colonies founded by the English-speaking race.

Mr. E. WARD TRENT remarked that a misapprehension existed as to the mode in which the flax was prepared by the natives of New Zealand. The notion generally was that the leaves were scraped with a shell, but the fact was, incisions were made in the leaves, and the fibres were then stripped off, and formed the New Zealand flax of commerce. He felt persuaded that the method of cleaning the flax introduced by Thierry and others, would prove a failure, for this reason: that the persons employed in the work were not practical men; and they lost sight of one fact which the natives had discovered, viz., that one side of the leaf contained the silk-like fibre, whilst on the other side there was a ribby material; and under the process of Thierry these two materials became mixed together, producing a rough and unmanageable article. He thought any method which failed to separate the two classes of fibres, as was done in the native mode of preparing the flax, would be an utter failure. He had experimented upon most of the fibres that had been brought into the market during the last 25 years. The reason why New Zealand flax had been so little taken up was from the fact that it came over heckled, and the yellow bark, which had a deteriorating effect upon ropes made from it, was not got rid of. The quantity of material necessary for a three-inch rope with the yellow bark in it, would not be sufficient for a two-inch rope when that substance was not present. The specimens now exhibited confirmed the opinions he had previously expressed in the *Society's Journal*, that the methods of cleaning the flax recently introduced were complete failures, and it was a subject which still required investigation.

Mr. JOHN TOPHAM wished to inquire whether coal was worked in New Zealand to a sufficient extent to warrant a steam navigation company in depending upon it as a source of regular supply.

Mr. STONES said it was not so at present.

Mr. RIDGWAY remarked that that was because there was a want of labour to work the coals.

The CHAIRMAN, in proposing a vote of thanks to Mr. STONES, said the extraordinary interest and value of his paper merited their warmest acknowledgments. When they looked at New Zealand and reflected what it was 20 years ago, and saw the immense progress that the colony had made in that time, and the development of its resources under the enterprise and skill of its Anglo-Saxon settlers, they must feel more than ordinary obligations to the gentleman who had brought this interesting subject before them. Twenty years ago there was

a population of only 4,000 Europeans in New Zealand; it now numbered upwards of 40,000, who, being themselves Christians, might look for the conversion of the native population to Christianity, and the development of those industrial arts which invariably followed in the wake of European colonisation. The paper had been a most attractive one, from the variety of subjects it embraced, and he was sure they would heartily accord their thanks to Mr. STONES.

A vote of thanks was passed to Mr. STONES.

The Secretary announced, that on Wednesday evening next, March 3, a paper by Mr. A. G. Findlay, "On the Progress of the English Lighthouse System" would be read. On this evening Henry Cole, Esq., C.B., will preside.

The Secretary also announced that the drawings by W. Mulready, R.A., the result of the Mulready Exhibition of 1848, about to be presented to the trustees of the National Gallery, will be exhibited on Wednesday evening next, when the Chairman will, previous to the reading of the paper, call attention to, and make a few remarks upon, the circumstances attending the presentation.

NORTHERN ASSOCIATION OF MECHANICS' INSTITUTIONS.

The Northern Association of Literary, Mechanics', and Educational Institutions of Durham, Northumberland, Cumberland, and Westmoreland, was established in 1848, the object being the publication of an annual report, affording facilities for obtaining lecturers of ability on moderate terms, the free use of 100 manuscript lectures, the annual meeting of delegates, held every year in a different locality, at which meetings valuable information is elicited, and mutual sympathy and encouragement given for further exertions, the procuring of parliamentary reports free to the societies, advice where it is desired, on every subject connected with Mechanics' Institutions, to revise rules, to examine and grant certificates and prizes to the members of the associated Institutions, the interchange of privileges between the members of different localities, so that the members of one being temporarily in the neighbourhood of any other, may enjoy for a limited period the privileges of admission to its library and reading-room, and to offer suggestions for the formation of new societies, and generally to co-operate for the mutual benefit and encouragement of all societies having for their objects the intellectual improvement of the community.

In 1849 the Itinerating Library was established by Mr. J. L. Thornton, the honorary secretary, which has been followed by other unions forming similar collections of books for the use of the Institutions in their unions. The following are the rules of the library:—

- I. That the books are intended exclusively for the use of the members of the Societies forming the Union.
- II. That twenty volumes shall form one set; and that no society shall have more than one set at once.
- III. That two months shall be allowed for each set of books; and if not returned within the time specified, the society detaining them shall pay a fine of sixpence per day.
- IV. That the carriage of the books shall be defrayed by the societies.
- V. That the books shall be sent at the risk of the societies, who shall replace them if lost or damaged.
- VI. That, in every case, proper directions shall be for-

warded to the secretary, as to the manner in which the books have to be sent to each society.

VII. If any book be written in, or otherwise damaged, the society in whose hands the book was at the time shall pay the value of it, or replace it.

VIII. That when books are returned, they are to be delivered, free of all charge, to the secretary.

IX. No society shall be allowed to have books until its subscription for the current year has been paid.

X. No books shall be re-entered to the same society until the expiration of two months.

The principal object of the library was to supply small localities with a new selection of books. Many villages are so circumstanced, that where young people have no means of obtaining mental improvement by reading, the public-house is the only alternative for social intercourse and relaxation. The Itinerating Library of the Association was instituted to supply this deficiency, and to transmit to small societies and places where no reading-room exists, a succession of books calculated to improve the minds and elevate the character of the people. Although there are 36 boxes of books constantly circulating, the want of more books prevents the Association from extending the application of this great moral power to the extent which is desirable, and the demand which is constantly made upon them. The Association is under great obligations to His Royal Highness the Prince Consort for a valuable present of above 200 volumes to this library.

The following are the general rules of the Association:—

1. That the society be called "The Northern Union of Literary and Mechanics' Institutions," and that all Institutions including, amongst their objects, the intellectual advancement of the people, shall be admissible to the Union.

2. That the mode of admission shall be by a majority of the votes of the council, provided the society seeking admission shall forward to the Secretary of the Union a written application, signed by its secretary.

3. That the management of the affairs of the Union shall be intrusted to a council, consisting of a President, Treasurer, and Secretary, and ten other members, who shall elect their own chairman. The council shall be empowered to fill up vacancies which may occur during the year, and, generally, to be the medium of communication in any plans of co-operation among the Institutions in the Union. That Newcastle be the seat of the council.

4. That the expenses of the council shall be confined to the cost of advertisements, postage, the annual meetings, printing, copying of lectures, stationery, books, prizes, &c., &c.; and that the subscription be as follows:—Institutions having less than 200 members, 2s. 6d., and those having 200 members and upwards, 5s. per annum, payable in advance, and due immediately after the annual meeting.

5. That it shall be one of the objects of the Union to promote the exchange and circulation of lectures among the associated Institutes. The Union shall direct its attention to the development of all measures calculated to promote the moral and intellectual advancement of the people.

6. That an annual meeting of one delegate from each Institute having less than 200 members, and two delegates from each of those having 200 or more, shall be held to receive the report of the Union for the preceding year, to appoint a new council, to fix the place of the next meeting, and to confer upon any suggestions or new plans relating to the management of Mechanics' Institutes. The time of meeting to be fixed by the council, and six weeks' previous notice of the same shall be given to each society.

7. That, fourteen days prior to the annual meeting, each Institute shall transmit to the council a condensed report of its proceedings for the year.

8. That no alteration in the laws of the Union shall be made except at the annual meeting; nor then, unless notice of the same in writing shall have been sent to the secretary of the council at least one month previous, and been by him notified, at least three weeks before the day of meeting, to every society in the Union.

9. That no Institution shall separate from the Union except at the annual meeting; nor then, unless it shall have given one month's previous notice.

10. That the council shall be required to call a special meeting of delegates, provided two-thirds of the Institutes in the Union require it. The council in such case shall forthwith give one month's notice of the day of meeting to all the Institutes in the Union.

11. That the council may elect as honorary associate persons eminent for their attainments in literature, science, or art; or who have borne a distinguished part in promoting the welfare of Mechanics' Institutions, and furthering the progress of education.

12. That any person subscribing to the Union as an honorary member shall have the privilege of nominating one or more Institutions (according to the amount annually subscribed), which shall participate in all the benefits of the Union; and, in cases where this is not done, the right of nomination is assumed by the council. The honorary members are entitled to hold office, and to attend and vote at the annual meetings.

The Prizes and Examinations for the present year are as follows:—

The Examiners will award three classes of certificates, viz., 1. Certificate of Excellence, 2. Certificate of Proficiency, 3. Certificate of Competency; and to the highest certificate the Council will award the diploma of an honorary member of the Association. The Council of Examiners may recommend some additional prize to those whose acquirements deserve further recognition. Several merchants and manufacturers have intimated that they will receive the certificates of the Association as satisfactory in the appointment of clerks, &c.

The Examination will be conducted by written paper and oral examinations.

Every candidate offering himself for examination will be required to be a member of one of the associated Institutions, and to give notice to the Secretary on or before the 1st of June, and to state the subjects on which he wishes to be examined, and the books which he has studied.

Examinations will be held in English literature, grammar, and composition; writing from dictation; geography; arithmetic—common, vulgar, and decimal fractions, reduction, proportion, practice, and interest; book-keeping by double and single entry; mathematics; mechanics; chemistry; physiology; natural history; botany; mechanical and free hand drawing; English history; Latin, French, and German.

PRIZES FOR 1858.

The following regulations must be observed with reference to the prizes:—That the competitors must be members of one of the associated societies. That the essays, &c., must be sent to the secretary (post-paid), under cover, endorsed with an English motto, and accompanied with a note, endorsed with the same motto, containing the author's name. The notes of the successful candidates only to be opened, and their name disclosed, after the Examiners shall have determined what essays are the best. The length of the essays not to exceed sixteen pages of the printed matter contained in one of the *Quarterly Reviews*, and they must be written only on one side of the paper, and in a good hand. That no essay shall be received after the 1st of July, 1858. When the language of other authors is employed, it must be marked by an inverted comma.

1. A prize of five pounds will be given by George Ridley, Esq., M.P., for the best essay—"Whether has the *Printing Press*, or the *Steam-engine* as applied to *Lo-*

motion by Land and Water, conferred the greatest benefit on mankind."

2. A premium in books, suitably inscribed and bound, given by a friend, for the best dissertation on "The Historical and Romantic Ballads of Northumberland."

3. A silver medal, by the Association, for the best essay on "What Effect have Works of Fiction produced upon the present Age, and to what Extent should they be admitted into Public Libraries."

In cases where there may be no competition for a prize, it shall be left to the option of the Examiners whether the prize shall be given.

The Council reserve to themselves the right to publish the whole, or any parts of the successful essays.

MATHEMATICAL PRIZES.—QUESTION I.

By S. Fenwick, Esq., F.R.A.S., &c.

A series of parabolas which have a common tangent, and also a common directrix, revolve about an axis perpendicular to the directrix; prove that their foci generate a surface of the second order.

QUESTION II.

By W. Rutherford, Esq., LL.D., F.R.A.S.

A grooved rigid rod of small diameter is placed with one end on a horizontal, and the other on a vertical plane, along which the rod slides without friction; and a particle, whose weight is inconsiderable with respect to that of the rod, is placed in a given position in the groove. How must the rod be placed initially, so that when it is abandoned to the action of gravity, and the particle allowed to move freely down the groove, the particle may just leave the groove at the instant the rod falls into a horizontal position?

QUESTION III.

By W. S. B. Woolhouse, Esq., F.R.A.S., &c.

Supposing a cube to be thrown into the air at random, and a shot fired through it, determine the value of the probability that the shot will pass through opposite faces of the cube.

For the best solution to each of the above questions medals will be awarded by the Association. The ingenuity and elegance, as well as the correctness of the solutions sent by the competitors, will come under the consideration of the Examiners in estimating the value of each contribution. The mathematical prizes are open to all residents in, and natives of, the four northern counties. The solutions must be sent on or before the 1st of July, 1858.

The following gentleman are the Honorary Examiners:

Mr. George Bell, M.A., Newcastle.

Dr. Charlton, Lecturer on the Principles and Practice of Physic, &c., in the Newcastle College of Medicine.

Mr. James Clephan, Gateshead.

J. P. Dodd, LL.D., North Shields.

Mr. T. Doubleday, Author of "The True Law of Population," "Mundane Moral Law," &c., &c.

Mr. D'Acosta, Professor of Languages, Royal Grammar School, Newcastle.

Dr. Embleton, F.R.C.S., &c., Professor of Medicine in the University of Durham.

Mr. Stephen Fenwick, F.R.A.S., Royal Military Academy, Woolwich.

Mr. Grant, Author of "Madonna Pia," &c.

Dr. Humble, Lecturer on Materia Medica and Therapeutics, Newcastle College of Medicine.

Mr. R. Malcolm, Trafalgar-st. Academy, Newcastle.

Mr. T. F. McNay, Lecturer on Surgical Anatomy to the Newcastle College of Medicine.

Dr. Richardson, M.A., Professor of Chemistry in the University of Durham.

Dr. Rutherford, F.R.A.S., Royal Military Academy, Woolwich.

Rev. J. Snape, Head Master of the Royal Grammar School, Newcastle.

Rev. W. Spencer, B.A., St. John's College, Cambridge.

Mr. H. Wilson, Romulus-terrace, Gateshead.

Mr. W. S. B. Woolhouse, F.R.A.S., London.

Home Correspondence.

THE PUDDLING OF IRON.

SIR,—In reply to Mr. Wentworth Scott's letter which appeared in last week's *Journal*, I beg to state that an answer will be found to that gentleman's inquiries in the *Philosophical Magazine* for September 1857, in which Mr. R. Johnson and myself have published the details of our experiments on the chemical changes which pig iron undergoes during its conversion into wrought iron.

I am, &c.,

F. CRACE CALVERT.

Manchester Royal Institution, Feb. 24, 1858.

MEETINGS FOR THE ENSUING WEEK.

MON. Royal Inst., 2. General Monthly Meeting.

Entomological, 8.

Med. and Chirurg., 8. Anniversary.

TUES. Royal Inst., 3. Prof. Huxley, "On Biology."

Civil Engineers, 8. Discussion, "On Submerging and Re-

pairing Telegraphic Cables."

Pathological, 8.

Photographic, 8.

WED. Society of Arts, 8. Mr. A. G. Findlay, "On the Progress of the English Lighthouse System."

Pharmaceutical, 8.

THURS. Royal Inst., 3. Prof. Tyndall, "On Heat."

Zoological, 3.

Royal Society Club, 6.

Antiquaries, 8.

Chemical, 8. Messrs. Perkin and Duppa, "On the Action of Bromine on Acetic Acid."

Linnæan, 8. J. Dr. Lindley, "Contributions to Indian

Orchidology," II. Mr. Benthham, "Synopsis of the

Lignosities," III. Mr. Curry, "On the Fructification of the compound *Sphæria*."

Philological, 8.

Royal, 8½.

FRI. Archeological Inst., 4.

Royal Inst., 8½. Prof. C. Piazzi Smyth, "Account of the

Astronomical Experiments on the Peak of Teneriffe in

1856, illustrated by Photographs."

SAT. Asiatic, 2.

Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the

Elements which circulate in Nature."

Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 17th February, 1858.

60. Dead Letter Office—Return.

65. Patriotic Fund (Colonies)—Return.

70. East India (Additional Troops)—Return.

74. East India (Police)—Return.

Delivered on 14th February, 1858.

46. Statute Law Commission—Return.

67. Queen Anne's Bounty—Account.

73. East India (Governor General)—Return.

79. East India (Sir Peregrine Maitland)—Return.

80. Sardinian Loan—Account.

81. Greek Loan—Account.

82. Russian Dutch Loan—Account.

20. Bills—Medical Charities (Ireland) Act Amendment.

21. —Joint Stock Banking Companies.

Delivered on 19th February, 1858.

49. Westminster New Palace—Return.

57. Savings Banks (Number of Depositors, &c.)—Accounts.

57. (1.) Savings Banks (sums paid in or withdrawn)—Correspondence.

Delivered on 20th and 22nd February, 1858.

44. Excisable Liquors, &c., (Scotland)—Return.

69. Poor Relief—Return.

77. Public Debt—Account.

71. East India (Missionaries, &c.)—Return.

84. Mint—Account.

87. Committee of Selection—First Report.
 47. Cambridge University—Copies of Statutes.
 23. Bill—Prescription (Ireland).
 SECOND SESSION, 1857.
 296. East India (Cotton)—Return. Part 1. Bengal and North Western Provinces.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 19, 1858.]

- Dated 5th January, 1858.*
 117. John Platt, Oldham—Improvements in machinery or apparatus for spinning and doubling or twining cotton and other fibrous materials.
Dated 21st January, 1858.
 108. John Joshua Robinson, Fratton, near Portsea—Improved apparatus for sorting and stamping letters, books, newspapers, and other articles.
Dated 29th January, 1858.
 161. Edward Hammond, Nos. 90 and 91, Herbert-street, Hoxton—The manufacture of cap fronts, and applicable to the manufacture of ruffles, ribbon trimmings, and other articles of millinery.
Dated 1st February, 1858.
 177. Thomas Heppleston, Manchester—Certain improvements in machinery or apparatus for doubling, twisting, and reeling yarns or threads.
 179. James Alexander Manning, Inner Temple—Improvements in the manufacture or production of manure.
 181. James Childs, Belmont, Vauxhall—An improvement in the manufacture of the boxes or cases used for night lights.
 183. Josiah Haste, New Dock Works, Leeds—Improved apparatus for preventing the explosion of steam boilers.
 185. Richard Archibald Broome, 166, Fleet-street—Improvements in sewing machines. (A communication.)
Dated 2nd February, 1858.
 187. William Cartwright Holmes and William Hollinshead, Huddersfield—Improvements in the manufacture of gas, and in apparatus employed therein.
 189. William Edward Newton, 66, Chancery-lane—An improved instrument for sharpening the blades of knives. (A communication.)
 191. William Westley, Birmingham—Certain improvements in the construction of heels for boots and shoes.
 192. John Gray, Bonally Tower, Colinton, near Edinburgh—Improvements in printing machinery.
Dated 3rd February, 1857.
 193. Edmund Moss, Manchester—Improvements in weighing cranes.
 194. John Morris, Red House, Great Bridge, Staffordshire—Improvement or improvements in boots and shoes.
 195. Alfred Hollis and Stephen Lee, Darlington—Improvements in the construction of chaldron-wagons and other railway wheels.
 196. Anthony Nicholas Armani, Haverstock-hill—Improvements in rail or tramways for streets and ordinary roads.
 197. Ernest François Dillage, 14, Boulevard Poissonniere, Paris, France—Improvements in machinery or apparatus for raising, forcing, and exhausting fluids, air, and gases. (A communication.)
 198. William Edward Newton, 66, Chancery-lane—Improved apparatus for raising and lowering the skirts of ladies' dresses. (A communication.)
 199. Leon Salles de la Magdeleine, Paris, France—An improved manure.
 201. William Longley, Erith, Kent—Improvements in apparatus for grinding and splitting grain.
 202. William Clark, 53, Chancery-lane—Improved hydraulic apparatus for obtaining motive power. (A communication.)
Dated 4th February, 1858.
 203. Joseph Harrison, Brailsford, Derbyshire—Improvements in apparatus for making cheese.
 204. Robert Harland, Derby—Improvements in the break lever guard of railway trucks.
 205. David Smithies, Manchester—Improvements in the manufacture of heads or harness for weaving.
 206. Benjamin Beale, Greenwich—Improvements in apparatus for paying out and drawing in electric telegraph cables, applicable also to the raising and lowering of weights.
 207. John Avery, 32, Essex-street, Strand—An improvement in mechanical movements for sewing and other machines. (A communication.)
 208. David Williams, Tredegar, Monmouthshire—Improvements in the construction of ovens or furnaces for the manufacture of coke, and in the means of emptying or discharging the same.
 209. George Bertram, Edinburgh, and William McNiven, Polton Mill, Leawade—Improvements in the manufacture of paper.
 210. Charles Knight, St. John's-wood—An improved railway guide.
 211. Julius Goodman and Louis Goodman, Finsbury-street, Finsbury-square—An improved portable umbrella.
 212. William Rhodes, Manchester, and Henry Napier, Brooklyn, New York—The production of a "new patent oil."
Dated 5th February, 1858.
 213. Alexander Crichton and Matthew Whitehill, Paisley, Renfrew, N.B.—Improvements in the application, adaptation, and use of knitted fabrics.
 214. Edward Collingwood and Thomas Collingwood, Certain improvements in machinery or apparatus for propelling vessels on water.
 215. Adam Woodward, and William Carter Stafford Park, Manchester—Improvements applicable to hoists and other apparatus or machinery for raising and lowering weight, designed as a provision against accidents, to which all apparatus or machinery is liable.
 216. James Welch, Southall—Improvements in railway and other carriage brakes.
 217. Sir Charles Shaw, Chapel-place, Cavendish-square—Improvements in constructing moveable or field batteries.
 218. Samuel Williamson, Hanover-street, Cork—Improvements in the construction and mode of affixing street and other lamps or lanterns.
 219. Samuel Dyer, Bristol—Improvements in the method of moly, furling, and securing all the sails of ships or vessels.
Dated 6th February, 1858.
 222. William Potts, Handsworth, Staffordshire—Improvements in painting upon glass, and in protecting paintings upon glass.
 224. William White and Joseph Parib, Great Marylebone-street—Improvements in the preparation or treatment of cuirpierre, papier maché, and such like plastic substances, and in the application of such matters to walls, ceilings, and other internal parts of buildings, berths, and other parts of ships and other vessels, carriages, and other structures.
 225. William Ball, Rothwell, near Kettering, Northamptonshire—Improvements in the construction of ploughs.
 226. John Miller, Upper George-street, Edgware-road—Improvements in machinery for the manufacture of bread. (A communication.)
Dated 8th February, 1858.
 227. Robert Wilson, Liverpool—Improvements in propelling steam-gable vessels.
 228. François Mathieu, Lawrence-lane—Improvements in sun-scoops.
 229. Julius Decimus Tripe, Commercial-road—Improvements in apparatus for securing window shades or casements. (For a communication.)
 230. Pierre Simon Meroux, St. Denis, France—Improvements in fire bars and grates for furnaces or other fire places.
 231. Robert Cunningham, Paisley, Renfrew, N.B.—Improvements in or connected with the production of letter-press surfaces and surfaces used in reproducing ornamental turns or devices by printing or otherwise.
 232. Edward Dench, Chelsea—An improved boiler for hot water for heating and warming.
 233. Richard William Johnson and William Stabbeid, Worcester-shire—Improvements connected with the levers of railway wagons.
 234. William Edward Newton, 66, Chancery-lane—Improved machinery or apparatus for breaking stones, marble, and analogous substances. (A communication.)
 235. Henry Ball, Birmingham—Improvements in repeating other fire-arms, a portion of which improvements are applied to ordnance.
 236. Edward Reader and John Dewick, Finkhill-street, Licham—Improvements in lace machinery for the making of velvet lace and looped fabrics, and in the fabric produced by such machinery.
Dated 9th February, 1858.
 237. Charles Askew, 271, Charles-street, Hampstead-road, David Ritchie, 42, William-street, Regent's park—Improvements in roasting machine for meat, poultry, or game kind, to be worked by spring jack movements, or by ordinary smoke jack.
 238. John Wells, Percival street, Clerkenwell—Improvements in watch cases.
 239. William Brown and Charles Neale Day, Devon—Improvements in sluice valves.
 242. Evan Leigh, Manchester—Certain improvements in engines for carding cotton and other fibrous materials.
 243. John Taylor, Swanton Nova, Thetford—An improvement in the construction of horse hoes, applicable also to drills.

WEEKLY LIST OF PATENTS SEALED.

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| February 19th. | 2258. John Gedge |
| 3010. Julien d'Heille and Albert Viscount de Warequiel | 2259. William Hargreaves |
| February 23rd. | 2268. Charles Thompson |
| 2236. George Daniel Davis | James Thompson |
| 2243. John Gedge | 2274. John Drumgoole |
| 2248. Henry Parry | 2392. William Jenkins |
| 2251. John Jervis Tucker and George Hazland | 2394. David Thorpe Lee |
| 2252. Werner Stauffen | 2404. Richard Brown |
| 2256. Philip Hill and John Moore | 2406. Peter Armand de Fontaine |

PATENTS ON WHICH THE STAMP DUTY OF 240 HAS BEEN PAID.

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| February 15th. | 398. William Hartley |
| 361. John Oxley | Joseph Wootton |
| 374. Frederick Blacket Edward Beaumont | 409. Barnaby Angelo |
| February 19th. | 453. Thomas Sadler |
| 389. Paul Prince | February 23rd. |
| 390. Charles Low | 367. David Hulet |
| | 386. Frederic Prince |

Journal of the Society of Arts.

FRIDAY, MARCH 5, 1858.

COUNCIL.

The Council will be specially summoned, for Wednesday next, the 10th instant, at 6 o'clock, to consider—

1. Whether this Society should at once announce its intention to direct and superintend an Exhibition, in 1861, or any other year.

2. What should be the exact character of such an Exhibition.

3. Whether the surplus funds, if any, should be appropriated by the Society to the advancement of Arts, Manufactures, and Commerce.

EXAMINATIONS, 1858.

In accordance with the new Bye-laws, the Council have had under consideration the appointment of the Board of Examiners. Having to nominate only one Examiner for each of the subjects included in the "Programme" for 1858, the Council have found themselves charged with the delicate and difficult duty of selecting less than a moiety of the names of those gentlemen who in the autumn of last year had liberally consented to serve gratuitously as Examiners this year.

The Council could not but feel that the Society was under much obligation to those gentlemen, many of whom had already given their valuable services gratuitously in former years; and it was a difficult but necessary duty to make the requisite selection.

The Council have now the pleasure to announce that the following gentlemen have been appointed the Board of Examiners for 1858:—

Arithmetic.....	{ Rev. Alexander Wilson, M.A., National Society, London.
Book-keeping.....	{ John Ball, Esq., of the firm of Messrs. Quilter and Ball.

MATHEMATICS.

Algebra	{ Rev. Harvey Goodwin, M.A., Cambridge.
Geometry	{ Rev. B. Morgan Cewie, M.A., Professor of Geometry at Gresham College; one of H.M. Inspectors of Schools.
Mensuration	{ William Spottiswoode, Esq., F.R.S.
Trigonometry	
Conic Sections	

PHYSICS.

Navigation and Nautical Astronomy	{ John Biddle, Esq., M.A., Head Master of the Nautical Schools, Greenwich.
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Statics, Dynamics, Hy- drostatics	{ Rev. A. Bath Power, M.A., Principal of the Diocesan Training School, Norwich.
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Practical Mechanics

Magnetism, Electricity, and Heat.....	{ Charles Brooke, Esq., M.A., F.R.S., Surgeon to the West- minster Hospital.
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Astronomy	{ Rev. Baden Powell, M.A., Savilian Professor of Mathe- matics in the University of Oxford.
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Chemistry	{ Dr. A. W. Williamson, Pro- fessor of Chemistry, Univer- sity College, London.
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Animal Physiology	{ William Sharpey, Esq., M.D., F.R.S., Examiner in Uni- versity College, London.
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Botany	{ Arthur Henfrey, Esq., F.R.S., Professor of Botany, King's College, London.
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Agriculture

Political and Social Eco-
nomy

Descriptive Geography...	William Hughes, Esq.
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Physical Geography	{ Rev. Samuel Clark, M.A., Principal of the Training College, Battersea.
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English History.....	{ E. S. Creasy, Esq., Professor of History, University Col- lege, London.
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English Literature	{ Rev. F. Temple, M.A., Head Master of Rugby School.
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Latin and Roman History	{ F. B. Sandford, Esq., B.A., Assistant Secretary to the Committee of Council on Education.
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French	{ A. Mariette, Esq., Professor of French, King's College, London.
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German	{ Dr. Barnays, Professor of Ger- man, King's College, Lon- don.
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Freehand Drawing	F. S. Cary, Esq.
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Mechanical Drawing.....	{ Thomas Bradley, Esq., M.A., Professor of Geometrical Drawing, King's College, London.
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FINANCIAL PRIZE ESSAY.

The following gentlemen have, at the request of the Council, undertaken the duty of adjudicating upon the merits of the Essays sent in for competition:—

John Towne Danson, Esq., Fellow of the Statistical Society.

C. Neate, Esq., M.A., Professor of Political Economy in the University of Oxford.

Jacob Waley, Esq., M.A., Professor of Political Economy, University College, London.

TENTH ANNUAL EXHIBITION OF
INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of recent Inventions.

Persons intending to contribute to the

87. Committee of Selection—First Report.
 47. Cambridge University—Copies of Statutes.
 23. Bill—Prescription (Ireland).

SECOND SESSION, 1857.

296. East India (Cotton)—Return. Part 1. Bengal and North Western Provinces.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 19, 1858.]

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Dated 21st January, 1858.

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Dated 29th January, 1858.

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Dated 1st February, 1858.

177. Thomas Heppleston, Manchester—Certain improvements in machinery or apparatus for doubling, twisting, and yarns or threads.

179. James Alexander Manning, Inner Temple—Improvements in the manufacture or production of manure.

181. James Childs, Belmont, Vauxhall—An improvement in the manufacture of the boxes or cases used for manure.

183. Josiah Haste, New Dock Works, Leeds—Improvements for preventing the explosion of steam boilers.

185. Richard Archibald Broome, 166, Fleet-street—Improvements in sewing machines. (A communication.)

Dated 2nd February, 1858.

187. William Cartwright Holmes and William Dersfield—Improvements in the manufacture of apparatus employed therein.

189. William Edward Newton, 86, Chancery-lane—Improvements in an instrument for sharpening the blades of razors. (A communication.)

191. William Westley, Birmingham—Certain improvements in the construction of heels for boots and shoes.

192. John Gray, Bonally Tower, Colindale—Improvements in printing machinery.

Dated 3rd February, 1858.

193. Edmund Moss, Manchester—Improvements in the manufacture of cotton yarn.

194. John Morris, Red House, Great Britain—Improvements in the manufacture of cotton yarn.

195. Alfred Hollis and Stephen Lee, Great Britain—Improvements in the construction of chaldron wheels.

196. Anthony Nicholas Armani, Italy—Improvements in the construction of chaldron wheels.

197. Ernest François Dillage, France—Improvements in the construction of chaldron wheels.

198. William Edward Newton—Improvements in the construction of chaldron wheels.

199. Leon Salles de la Mota, France—Improvements in the construction of chaldron wheels.

200. William Longley, England—Improvements in the construction of chaldron wheels.

201. William Clark, England—Improvements in the construction of chaldron wheels.

202. Joseph Harrison, England—Improvements in the construction of chaldron wheels.

203. Robert Harland, England—Improvements in the construction of chaldron wheels.

204. David Smithies, England—Improvements in the construction of chaldron wheels.

205. Benjamin Beal, England—Improvements in the construction of chaldron wheels.

206. John Avery, England—Improvements in the construction of chaldron wheels.

207. David Williams, England—Improvements in the construction of chaldron wheels.

208. George Bertram, England—Improvements in the construction of chaldron wheels.

209. Charles Knight, England—Improvements in the construction of chaldron wheels.

210. Julius Goodman, England—Improvements in the construction of chaldron wheels.

211. William Rhoads, New York—Improvements in the construction of chaldron wheels.

212. Alexander C. Brown, N.B.—Improvements in the construction of chaldron wheels.

213. Alexander C. Brown, N.B.—Improvements in the construction of chaldron wheels.

214. Edward

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Journal of the

FRIDAY, 1858.

The Council
Wednesday 2nd
consider—

Lord Chelmsford,
in; the Right
Master of the Rolls;
Journey-General;
Her Majesty's

Members of the
ty for the En-
and Commerce,

to your Me-
ommodation is
entors, engineers,
al documents and
eal Patent Office,
ative models col-
ations, to which
from all parts of

the Laws affecting
in every branch of
Arts, and the pub-
largely facilitated
of these excellent
as only the present
this national under-

only one in the United
ve free access, not only
and Inventions of this
and other Documents
ted by numerous Foreign
responded to the desire
international relations
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ter of regret that, while a
nually accruing from the
ty, the buildings devoted
t Office are insufficient in
unfavourably with those of

fore, pray that you will be
steps as may seem to you ad-
on and maintenance of a com-
e worthy of this country, and
may be had to a Library,
Museum, furnished with the
odels indispensable to the right
ce of British Industry.

ORDINARY MEETING.

MARCH 3, 1858.

Ordinary Meeting of the One
h Session, was held on Wed-
t., Henry Cole, Esq., C.B.,
the chair.

Candidates were balloted for
members of the Society :—

Jones, Thomas Mayhew
West, Walter
Westmacott, Richard, R.A.

as by W. Mulready, R.A., the
ulready Exhibition of 1848, were
the Chairman made the following
reference to them :—

ablishing a National Gallery of British
cially fostered by the Society of Arts.
1847, the public possessed only those few
British School which had been purchased

with Mr. Angerstein's collection of pictures. British
pictures, indeed, at that time, in the judgment of the
great connoisseurs, ranked very much below second or
third rate Italian pictures. At a meeting held in Feb-
ruary, 1847, a proposal was made to this Society, which
always has the courage to be in advance of public opinion,
to assist in forming a National Gallery of British Art,
and the paper embodying the idea was read and discussed,
and may be found printed in the volume of Transactions
for the year.

It was suggested that an annual Exhibition should take
place of the works of some eminent living artist, and that
any profits which might result from this exhibition,
together with any special donations, should be applied
in purchasing some work or works of the artist whose
productions were exhibited, and that these works should
be presented to the National Gallery as a means of found-
ing a Gallery of British Art, and thus vindicating the
rights of National Art to be duly recognised in a National
Collection.

An exhibition accordingly took place of the works of
William Mulready, in the year 1848, and a small surplus
of £240 was obtained, which, having been paid to Mr.
Mulready, he, in return, has presented to the Society
three of his remarkable drawings, two in chalks and one
in pen and ink, which the Council have accepted, and have
offered them to the trustees of the National Gallery in
accordance with the original proposal. Previous to ac-
cepting the drawings offered by Mr. Mulready, the Council
referred the matter to a Committee to report to them
on accepting the works submitted. That Committee
consisted of the following gentlemen :—Sir Charles East-
lake, P.R.A., Mr. John Bell, Mr. F. S. Cary, Mr. J. C.
Horsley, A.R.A., Mr. B. Redgrave, R.A., Mr. D. Mac-
lisse, R.A., Mr. S. Haden, Mr. W. Hawes, Mr. S. Hart,
R.A., Mr. S. Hickson, Mr. David Roberts, R.A., Sir J.
P. Boileau, Bart., Mr. J. Thompson, Mr. C. Wentworth.
Dilke, Mr. H. Cole. That Committee reported as follows:

"The Committee have carefully examined the draw-
ings liberally offered by Mr. Mulready, and are unani-
mously of opinion that as studies which have been rarely
equalled in ancient or modern times, they are well
worthy of the acceptance of the Council, with the view
of offering them to the trustees of the National Gallery.
"Considering the number of pictures by Mr. Mul-
ready, which the nation now possesses, the Committee
are of opinion that he has shown sound judgment in
offering drawings which exhibit the successful use of
chalks as well as what may be done by the pen in the
hands of an accomplished artist."

Mr. Etty's pictures formed the second exhibition,
which hardly paid its expenses, and the further prosecu-
tion of the idea was dropped, because a National Gallery
of British Art was being formed by other means.

In 1847, a few months after the idea thus nurtured by
the Society had been suggested, Mr. Vernon gave his
pictures to the nation.

Some time before Mr. Vernon's gift was made, Mr.
Sheepshanks had stated generally to his friends that he
proposed to give his pictures to the country, and Mr.
Sheepshanks consulted Mr. Vernon on the expediency of
making a joint gift of their separate collections of pic-
tures, coupling with it the condition that the government
should first provide a suitable building to receive them.
Unfortunately for the exhibition of the pictures, Mr.
Vernon preferred to stand alone, and declined to co-op-
erate with Mr. Sheepshanks, and his pictures, having first
been concealed in the basement of the National Gallery,
have been for years only a little less invisible on the
ground-floor of Marlborough-house.

Owing to his foresight, Mr. Sheepshank's pictures have
been well-housed and are seen, even far away in the wilds of
Kensington, by greater numbers in a corresponding period
than visit Mr. Vernon's dimly-lighted pictures at Mar-
borough-house. Turner, too, has given his magnifi-
cent collection to the country. The effects of the Law

bequest will also tell in forming a British Gallery, and the idea of a British Gallery of Art, which the Society thought it right to cherish in 1847, seems likely to grow to such dimensions as to require some new mode of treating it.

As the treasures of Art accumulate, common sense suggests that they should not be allowed to form an overgrown wearisome centralized collection, loomed only in one spot of the metropolis, but that the finest specimens should be chosen for the central gallery, and that the whole country should enjoy the means of borrowing the surplus. Encourage the provision of suitable buildings for exhibiting pictures and works of Art, not merely in the metropolis, with its three millions of people, spreading over a diameter of twelve miles, but over the whole kingdom, and circulate the superfluous pictures from local gallery to local gallery. The State, with local co-operation, would then do with National pictures that which the wealthy have been accustomed to do with their own pictures with safety at the British Institution for more than half a century.

If the Vernon, Turner, and Sheepshanks pictures were all collected together, a noble gallery of British Art would be formed, and at least half the whole number of pictures would be available for circulation over the whole kingdom. Mr. Sheepshanks' gift provides for such a distribution. The Treasury and trustees of the National Gallery have full powers over the Turner bequest, but an Act of Parliament would be necessary to render the superfluous Vernon pictures generally useful. This principle of distribution is already in full operation with works of Ornamental Art belonging to the Kensington Museum. Every local School of Art is privileged to borrow whatever is portable, and experience has shown that even Venetian glass and precious Majolica may be safely circulated. A thousand pieces were sent to the Manchester Art Treasures Exhibition, and not a single accident took place. The distribution of pictures would be all the easier, and might be managed with the least possible risk.

Should this suggestion of circulating works of art be acceptable to the public, it may be hoped that these Mulready drawings may assist in giving some practical direction to it.

The Paper read was :—

ON THE PROGRESS OF THE ENGLISH LIGHTHOUSE SYSTEM.

By A. G. FINDLAY.

It is now ten years since I had great pleasure in drawing the attention of the Society of Arts to the Lighthouse system of our country, a system which, viewed in relation either to its utility, or to the beauty and excellence of its details, is worthy of the highest admiration of a nation which boasts of its maritime superiority. Yet, at the period I allude to, the beautiful appliances of science, the results of profound investigation therein, were but imperfectly understood or appreciated by those unconnected with it, and there was no work which embodied the description and pointed out the utility of our lighthouses.

In the paper above referred to, which is printed in the Society's Transactions for 1847-8, and in the excellent account of the Skerryvore Lighthouse, by Alan Stevenson, Esq., which appeared soon afterwards, the main features of the system, as then existing, are detailed.

The period which has since elapsed has not been unimportant, either in the improvements of lighthouses, or, in what is of more consequence, their requirements. It is proposed to treat of both these topics in the present paper. But before entering into the details of either of these two branches of our subject, some brief recapitulation of my previous account may be necessary, in order to put the present treatment in possession

of the main facts concerning pharology. This, in my former paper, will bear somewhat of an historical character, which it is thought will be less to derive the plan of the existing position and requirements of lighthouse.

First as to the illumination. There are two systems now employed: the older one of lamps with metal reflectors placed behind the light, the catoptric, and may be called the English system, and the other in which the light is controlled by lenses placed before it, or dioptric, known as the Fresnel or lenticular system which was first brought into general use in France.

The merit of priority in the former undoubtedly belongs to England. Polished metallic reflectors were invented in England, and first used at the Liverpool Lighthouse. Of late the credit of the invention has been given to Chevalier Borda, who, with the assistance of M. Less constructed some reflectors of silvered copper for the famous Cordouan lighthouse, off the mouth of the Gironde in the year 1780.

M. de Toulbire, a member of the Royal Corps of Engineers of Bridges and Roads in France, has also been considered by some as the first to have directed attention to the utility of paraboloidal reflectors, and is said to have proposed a revolving reflector light for the Cordouan in 1783. But in re-affirming the statement made on pp. 287 and 288 of the Proceedings of the Society, before referred to, that William Hutchinson, mariner and shipmaster of Liverpool, invented and used metallic reflectors at that port prior to 1777, and most probably 1763, an anecdote which I have met with adds to the certainty of the early date of the invention.

It is stated that William Hutchinson, in the year 1763, laid a wager, which he won, that he would read from a book, at the distance of 200 feet, by the light of a farthing candle. He did this with the aid of one of the Liverpool Lighthouse reflectors.

The reflectors used in the Liverpool lighthouse at the period alluded to, were formed on a parabolic curve of 11 and 3 feet focus, and 8, 5½, 7½, and 12 feet in diameter, smaller ones of tin plates soldered together, and the body of wood, covered with looking-glass. The lamps consisted of flat wicks of from 8 to 14 inches broad, supplied with oil being kept uniform by a dripping-pot behind the reflector, as shown in the diagram. These more perfect reflectors are described in Hutchinson's excellent work entitled "A Treatise on Practical Seamanship," and published in 1777. Mr. A. Stevenson, in a second edition of the same work, published in 1811 under a different title, running thus: "A Treatise on the best form of Merchant Ships, &c.," has been to give the priority to the French.

The next advance in the economizing of light was made by Mr. Thomas Smith, the engineer to the Scotch Lighthouse Board, who, in 1786, introduced thereof which I have the pleasure to exhibit. It is formed of hollow paraboloidal mould of plaster, lined with mirror glass. Mr. Smith originated this idea without being aware of what had been done at Liverpool and in France previously. These contrivances were used prior to Argand's invention of the tubular lamp, which was a great step in the art of illumination. The first polished metal reflectors used in Great Britain were placed in the Inch Keith lighthouse in 1808.

As far as the principle is concerned, the catoptric system was perfect when Captain Huddart determined the best form for the parabolic curve of these reflectors, and his principle is still in use. To understand the action of these reflectors, a reference to the diagram will be sufficient; it will be seen that the form of the curve is such that, a line drawn from the focus striking any point of the inner curve of the parabola, will do so at the same angle as the horizontal ray reflected from that point; thus, rays of light, so reflected, will pass off in a horizontal direction; and, supposing that the light was a single

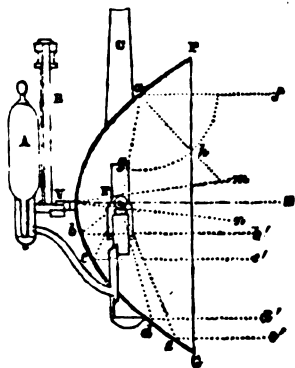
reflector would send forth a cylinder of rays equal in diameter to its double ordinate, or the diameter of its axis, consequently it would be impossible to show a light all round the horizon with any number of such instruments; but, as the flame of the lamp is about one inch in diameter, this subtends an angle of 14 degrees, at the vertex of the parabola, of 4 inches focus, (usual size of lighthouse reflectors); this, with other circumstances, makes it necessary to use from 25 to 33 reflectors to form a complete zone of light.*

The catoptric system is still in use in the majority of lighthouses, as it possesses some advantages over the dioptric system, as will be seen presently.

The dioptric or lenticular system, like that of the reflector, has arisen, step by step, to its present condition. A great disadvantage which a lens must be to control any great amount of light, would require such a mass of material in many conditions render the ordinary convex lens applicable to the purpose. The general plan of the apparatus now used, was suggested as a good form of burning lamp by Buffon, in 1773. For lighthouse purposes the form now applied was first proposed in Britain, by David Brewster, in 1811, who showed that a lens might be built up of separate pieces to any size. Previous to this, in 1780, the Abbé Rochon ground down a light lens of glass to concentric rings, and a similar lens was made by Messrs. Cookson, of Newcastle-upon-Tyne, for the Northern Lighthouse Board. The great trouble and delay attending the construction of such lenses prevented their general use.

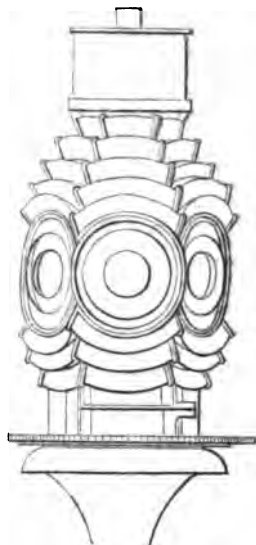
In the year 1819, M. Augustin Fresnel, without knowing what Sir David Brewster had done in England, ground a polyzonal lens of the same character, and in conjunction with M.M. Arago and Mathieu, sent the system to the Cordouan lighthouse. The apparatus was first shown on July 23, 1823. Augustin Fresnel subsequently made the system

FIG. 1 is a vertical section of a reflector; F the focus and



much more perfect, and hence it is generally called by his name.

The lenticular apparatus is placed around the single central lamp, as shown in the example I am enabled to exhibit. The arrangement of glass is so constructed as to refract the rays emitted from the lamp in the focus of the apparatus in every direction, into beams parallel with the horizon.



This apparatus is a holophotal fourth-order lens, showing a revolving light. The oil reservoir is placed over the apparatus, which consists of six polyzonal lenses around the flame of the lamp, above each of which are six portions of catadioptric rings, which are made concentric with the central portion, below which are three central rings. On the revolution of this machine each face sends forth a flash of nearly the whole light emitted by the lamp. I am indebted to Messrs. Wilkins and Co. for the opportunity of showing this apparatus.

It will be readily understood, that for an instrument of this character to perform its office, many conditions are necessary, first the glass, which is used in such large masses must possess perfect homogeneity, it must possess great transparency, and its figure must be formed with great accuracy to ensure successful operation. Its action may be briefly explained as follows, assisted by the illustrative diagram. A plano-convex lens of 30 inches diameter, as required in a first-order apparatus, would, if not formed on the polyzonal principle, be above 11 inches in thickness in the middle, a condition manifestly impracticable. The convex surface of the lens is, therefore, supposed to be cut into circular zones of triangular section, so that all the solid portion of the lens is dispensed with; these sectional zones are then arranged on one plane, and have the same refractive properties as if they were one solid piece, because the two surfaces are of the same relative figure.

For a revolving light, the lenses of the central portion of the apparatus are arranged into an octangular prism which in the largest or first-order light is 6 feet $\frac{1}{4}$ inch in diameter. For a fixed light the central part of the apparatus is formed of a band of lenses whose section is determined by the horizontal revolution of the figure of the polyzonal lens. This portion of a first-order light economises rather more than one-fourth of the whole light emitted by the lamp in its focus, or 92 deg. At first it was thought impossible to construct this central drum or belt of a circular form, and it was then made a polygon of thirty-two sides, but Messrs. Cookson, in 1836, constructed a circular one, which greatly increased the power and utility of the apparatus.

of the flame of the lamp; A the oil fountain; C the glass tube. The angle of incidence being equal to the angle of reflection, the angle $V a g$ at which the ray $F g a$ falls on the surface of the parabola at the point a is equal to the angle $a f$, at which it is reflected from the surface; therefore, the line $a f$ made by the ray falling on, and being reflected from, the surface, will be bisected or divided into two equal parts by the tangent to the parabola at the point of incidence. Therefore the angle $g a f$ is bisected by $g a m$, that is, the angle $g a m$ is equal to the angle $a m f$. The peculiar property of the parabolic curve is that the ray, when reflected from the surface, is always thrown in a direction parallel to the axis of the parabola; that is, the direction $a f$ of the reflected ray is parallel to the axis $F Z$. Thus a copper reflector, lined with polished silver, formed to such a curve, with a mathematical point of light placed in its focus, as F , will reflect the light in straight lines, parallel with its axis $V Z$, as $V a f$, $V e e'$, &c., and thus send forth a cylinder of light, the diameter of which is equal to the double ordinate of the parabola.

Paris is so superior to any of a similar kind that ble from our own country, that it is another of our French neighbours took the precedence this branch of scientific art; and thus a portion of the principal light apparatus, on a necessary for the safety of the mariner, had been removed before the removal of the excise duty on

turning this part of the subject into its will suffice here to state that the foregoing the general principles of lighthouse apparatus in 1847. The minor features, in their great may be followed in the excellent works of Mr. Aronson and M. Fresnel.

making a comparison of the efficiency and of the two systems,—a question which has been discussed,—many points have to be considered. usual with many to give the superiority, on the dioptric system; but there are numerous under which it can be demonstrated. committees of our Trinity Board have acted quite in favour of the reflector system, under which so many fine lighthouses have been established. As the peculiar properties of each will be sufficient for the discussions, involving a large mass of facts, we extend elsewhere.

of a paraboloidal reflector of 21 inches diameter, 18 inches focus, when viewed directly in front of the lamp, one inch in diameter, is equal to 1 flame; at a divergence of 7 degrees from the axis it is 2 flames; and between 9 and 10 degrees of divergence this distribution of the light. The useful amount of divergence altogether is 17 degrees, the actual amount from such a lamp is 22 min. Vertically, the divergence is 8 min., or it will be serviceable to 20 degrees. The useful property, as will be seen presently. It takes from 25 to 33 such reflectors to form a circle of useful light. But this cannot be done over the whole azimuth. The spaces between the axes of each reflector will be illuminated by the beam. This inequality in the distribution of light is the great disadvantage of the catoptric for a fixed light. For a revolving light, reflectors are placed on each side of a revolving frame, a flash may be attained quite as bright from the great annular lens of Fresnel. The effect of this flash is also three times the effect that from the lens—a great advantage, but the difference between the flashes are total, in which the dioptric system has the superiority.

The dioptric system owes its great superiority, for a fixed light, to its perfectly fulfilling the very important of distributing the light evenly all round the lamp. For a revolving light the eight lenses will produce of equal intensity, but of much shorter range than the 24 reflectors of the catoptric light. The secondary light from the fixed upper and lower lenses compensates for this inferiority. The lamp of the catoptric apparatus consumes the same quantity of oil as the dioptric reflector lamps, and is therefore more economical in the ratio of 5 to 8, supposing the serviceable effect of the lights to be equal, but this does not quite fairly represent the case. Fresnel calculates that in a first order of light for a fixed light, the brilliancy of the dioptric system in the central portion of the apparatus, will be equal to 140 flames, that of the cupola of catadioptric zones to 560 flames, and the lower zones to 60 flames, and 560 burners in all directions. Mr. Stevenson, probably nearer the mark, says 450 burners in the effect of the dioptric and catadioptric parts of the apparatus for a fixed light, and, calculating the effect of this apparatus as compared with the reflector light, that with the same quantity of oil, about the quantity of light is produced by the lenses

as by the reflectors; but then the light, as seen before the axis of each reflector, would be 50 per cent. more powerful than the dioptric light. In revolving lights, assuming the same calculations, the dioptric light is more advantageous than the reflector, in the proportion of 8·6 to 1. This is supposing that the light is required round the whole horizon, but in numerous cases only a portion of the circumference is required to be illuminated, and this circumstance still reduces the average superiority of the dioptric system, so that, all things considered, the relative advantage of each system may be from one and a half to twice in favour of the dioptric.

There is one appearance which is produced by the lenticular apparatus which could not be made by reflectors, and when the distinction between one light and another is of such paramount importance, this is no small object, I allude to the fixed light varied by flashes. Perhaps this variety may be overrated in its utility. Mr. Alan Stevenson does not think it of so much value in its distinctive characteristic, and, up to a recent period, our Admiralty included in their list all of this sort of light with the revolving lights. From the brief duration of the flashes, and the long interval between them, usually three or four minutes, they may not be observed, and, in some cases of hazy weather, or snow, or other adverse circumstances, be not made out, and thus the light might be mistaken for an ordinary fixed light. The flashes are sometimes coloured red. In the French light, where colour is employed as a distinction, it is very pale, but in our English lights, those thus shown, which are of such intensity as is considered to be a useful distinction, lose 0·8 of the whole incident rays, which enormous loss forms a great argument against the use of coloured media if it could be avoided. Green or blue shades are still more objectionable from their great absorptive powers.

The lamps which are used in these beautiful instruments are all more or less modifications of the cylindrical wick lamp invented by Argand, in 1783. Those in use for reflectors are the same as they were left by the inventor himself. For the great dioptric lamp, various contrivances have been made for regulating the supply of oil to the compound burner.

For a first-order light, this lamp consisted, in the first instance, of four concentric wicks, of the respective diameters of 0·827, 1·69, 2·52, and 3·89 inches, the smaller apparatus being constructed of 8 or 2 concentric wicks; but within these last 7 years the interior wick has been dispensed with in all the burners, it being found that a light of superior brightness can be obtained by allowing more air to pass into the flame on the inside, and forcing this air outwards on to it by a metal breaker or button kept below the level of the flame, so as not to interfere with the rays of light emanating from all sides of it. This, though it rather increases the consumption of oil, produces a far better light. The oil is made to flow into the burners by various means, as is stated above. Fresnel's invention consisted of a series of four small pumps, worked by clock-work, which forced the oil upwards to the flames. Another mode was by weights acting on a piston; a third by a spring doing the same office, a plan which has since become in universal use in the moderator lamps. Another mode, the pneumatic lamp of Messrs. Wilkins, acted by means of the pressure of air in the reservoir, and another, frequently applied of late, is by placing the reservoir slightly higher than the lamp, the oil thus flowing freely by its own gravity to the required level.

The fuel used in the English lighthouses in these excellent lamps up to the year 1846, was the best sperm oil that could be procured. At that period a change was made throughout the whole of the lamps, by adapting them to the use of colza or refined rape-seed oil, requiring a thicker wick. This oil was in use in the French lighthouses for some time prior to this, and was procured from the seed of a peculiar species of wild cabbage, known in the north of France under the name of

...ary, and the optical defect of the great advantage. We may cite as an example of the *Dunbar*, wrecked at Sydney, which was intended to be seen because it was overboard. There have been added to some of our lanterns in order to bring into their effect that they are

therefore, we may consider that our all future optical improvements can be based on the score of economy, and any increase will arise from the source of light. All lenses and reflectors aided by the most powerful light against the obscuring effects of the atmosphere, and to be able to conquer this difficulty will be the greatest step in economy.

Our system does not appear to be adapted for the present constructed. Mr. Wilkins has tried an arrangement of four lamps, behind which are lenses, being, in fact, a species of holophotal light. The great motion of the vessel prevents the keeping this apparatus constantly in a position, a condition which is absolutely necessary for action. Our light-ships are, therefore, with 12-inch reflectors, one of which is mounted on gimbals, readily follow the motion of the ship, and by their great diameter (consequent loss of light), obviate all the disadvantages which larger instruments would be. But then these lamps and reflectors, up to the present, are a superior light to ordinary lamps, and that comparison with those now used by us that they did in former years.

Chance, of Birmingham, the well-known makers, have successfully competed with our makers in the material as well as in the manufacture of light-house lenses; and I believe their is the only place in this country where they are carried on to any extent. The fine and the Lundy Island, at the entrance of the Bristol Channel, is an example of their construction. It is a holophotal apparatus, showing a revolving light, and more engaged in making some important improvements to our Trinity Board. It was believed that it could not be made in England so pure in colour, and the absence of colour, as to compare advantage with that made near Paris, but these difficulties have been overcome, and although I believe French material is employed, yet the improved apparatus have produced a result which compares well with the French apparatus shown in the French Ex-

hibition, and come to a very important point in the subject. In 1832, Lieut. Drummond proposed the use of the now well-known oxy-hydrogen light for illumination, and an extraordinary instance of its power was given at the time, showing that a Drummond light, 70 miles off, appeared nearer to the observer than an ordinary lighthouse lamp and reflector 12 miles off. A refrangible proof of its superiority if it could have been managed with certainty; but, notwithstanding the careful study and the most ingenious contrivances, it has been found impossible to maintain the light with the steadiness which is absolutely necessary for light-house purposes.

For several years since hopes were raised that the electric light would be so far perfected by Messrs. Staight and others as to supply this most desirable improvement, but the difficulty in maintaining the light in its normal position led to its abandonment.

It has been carried to greater perfection under the patronage of M. Duboscq, and is in general use in our experiments, but it requires delicate manage-

ment. The principle is that of passing the electric current between two vertical pencils of carbon. I am much indebted to Professor Goodeve for kindly exhibiting this beautiful light, which, as you see, when applied to the holophotal lens apparatus, has a most powerful effect. Mr. C. W. Harrison has made a different arrangement, which obviates the inconvenience of maintaining the exact distance between the two poles, which is the main difficulty in the vertical lantern, by making the positive pole a cylinder of carbon, which, by revolving under the negative point, presents a constantly fresh point to the action of the current, passing in a spiral direction from one end of the carbon cylinder to the other. Its action is seen in the apparatus before you. I believe that this is the first time it has been exhibited in public, and certainly it has a very promising commencement.

There are two great difficulties in solving the problem of a steady light from electricity. The first is in maintaining an equable force from the producing elements, that is, the battery, which, of course, will gradually decline in power after a short time, and no means have, as yet, been devised for so thoroughly obviating this, as to keep up for so many hours as the light must be shown. The next is at the outlet of this current; in preserving that exact distance between the two points of carbon, through which the arc passes, which maintains the light in its normal condition. These carbon points are usually, I believe, formed of graphite, the substance which is found lining the inner surface of old gas retorts. The rapid disintegration of the positive pole, the less diminution of the negative pole, and the irregularity of the consumption of both under the intense action, have baffled the ingenuity of almost all who have attempted to control them.

However, I am happy to say that I hear that the problem is about to be solved, and that ere long, probably, the electric light will be established at our finest lighthouse. This will be the greatest advance that has been made in pharology since the introduction of the existing system, which, in principle, may be said to have been perfect at the outset.

It is to the talent and patient ingenuity of Professor T. H. Holmes that we shall owe this grand improvement, and I much regret that the nature of the apparatus precludes the possibility of exhibiting it to you in this room, but those interested will, I dare say, soon have an opportunity of examining it elsewhere.

Mr. Holmes has adopted another form of originating the current than has hitherto been tried—that of magneto-electricity. The whole apparatus and its results are an admirable exemplification of the correlation of the physical forces—an evidence that one power may be traced throughout a train of operations until it emanates in a totally different form. The apparatus consists, I believe, of a series of very powerful permanent magnets, around the poles of which the helices are made to revolve by means of a steam-engine, and from the extent of the primary arrangement a most powerful magnetic current is produced, which, passing through the carbon pencils, shows that splendid light which entirely eclipses all other modes of illumination. I am not aware of the method by which Mr. Holmes regulates the distance between his electrodes, but the light exhibited last year, before the Trinity-house authorities, maintained a perfectly steady appearance for several hours, and doubtless might have been continued for any period. It is intended, I believe, to show the light from more than one point, so that it may be renovated without eclipsing it altogether, and even this changing of the electrodes is to be effected instantaneously.

This branch of our subject is worthy of the special attention of the Society of Arts, and an evening might well be devoted to the consideration of its merits. When once the system of illumination by electricity or any other similar light is practically established, we shall have an immense advantage in the capability of the light

colzat, or colza. This plant is extensively cultivated in Normandy, &c., the chief markets for the oil being Caen, Rouen, Lille, and Courtrai. That now used by the Trinity-house is chiefly refined by a patent process. This refined oil is of a superior character to the sperm oil; it produces a brighter flame, does not cause so much deposition on the wick, consequently, will burn much longer without trimming; any adulteration in it is much more easily detected than in sperm oil, and it is half the cost, although it has increased in value from 3s. 9d. per gallon on its first introduction, to 4s. 10d. at present. It is an excellent substitute for that oil, which is annually becoming dearer, and more open to being mixed with other and inferior oils. In the Liverpool lights olive-oil has been used since 1847—a change effecting a saving of 40 per cent. on the use of sperm-oil. In our colonial lighthouses other varieties of oil are used of which one only need be noticed as being used in the lighthouses near the Cape of Good Hope. This oil is procured from the tips of the tails of the Cape sheen and is said to be far superior to any other oil for brilliancy of light, but the quantity consumed, and the expenses are great. It costs 10s. 6d. per gallon, and the first-order light of Cape Agulhas consumes about 730 gallons a year; 462 gallons of rapeseed-oil would be necessary for a year's supply.

One great advantage in the refined rape-seed oil is that it does not thicken, except upon a very great degree of cold, a qualification which places it far above sperm-oil, many other oils for winter use. Indeed the disadvantage is a fortunate one in another respect. The untiring perseverance of the whale-fishers from the neighbourhood of Nantucket has so dispersed and destroyed the whales that it is almost doubtful if a continuous and abundant supply could be maintained, except at great price.

The purity of the fuel, and the perfect combustion effected by the present arrangement of lamp-glasses and flames used in the apparatus in their normal position, but it is necessary to carry off the products of combustion from the confined space of the lantern, for, if they were not disposed of, they would materially diminish the power of the light, and be a serious detriment to the health of the attendant. This is strictly required. This is effected by the tubes devised by Dr. Faraday, with the principle of which most are familiar; they are fitted to all lamps. A plan, similar in action, but less complete, was promulgated at the commencement of the last century by Dr. Van Marum.

As far as they were applied, then, the dioptric systems, in use in the year 1800, were not perfect, but still there was some waste of light in the direction by the divergence of the rays, and in another, by their construction. To remedy this loss of power led to the next system of pharology; since that period, some improvements have been proposed, by which some of the defects of the dioptric system have been remedied. M. Letourneau proposed lengthening the great flash of the dioptric lens into two equal portions, and setting each half at right angles to the other; this would produce the same effect, but at the expense of brilliant light. Some improvements also have been proposed, but the features of the system have not been altered. There is some waste of light in both dioptric and catoptric it is that angle which is formed by the lips of the reflector which strikes the horizontal ray which strikes the lens. That portion of the light is lost for useful effect, and is considered as serviceable. Stevenson proposed some improvements to this loss, upon what is termed the ordinary parabola.

The ordinary parabola

Boston Bay, Massachusetts. Mr. Alexander, in his numerous colonial lights, having introduced a lantern tower on Bermuda, and stations, one of which, he repaired its head near the tower now being built on the point of Good Hope, he has made the lower part of the tower, and these flanges are filled with a perfect protection of iron. He has proposed to place the dreaded Skerki Rocks, an important lighthouse of Ceylon, an iron tower of which a granite casing, is being built, affording protection from the tremendous waves. A lighthouse here would obviate some of the danger. The sloping base of the tower, and in the case of the Eddystone, was much injured by the waves mounted up the side of the rock. Numerous examples in nature show the tremendous shock of the waves, which, the St. Peter or Black Rock, of Japan, shown on the chart as a good example. The admirable Eddystone, erected by Mr. Wyatt, also be cited. This might have been its unfortunate destruction at the Gordon, in using wood as a material for its adjuncts, proposes to use iron for its preservation. This construction, for a few minutes, in a saturation of ammonia, under a pressure of 100 lbs. The rationale of this process is, the wood becomes saturated with ammonia, and therefore no chemical action of sea-water decay.

Described, briefly and imperfectly, the progress of lighthouses—their progress towards their present condition. All that I have to say, in present operation, with the exception of the Eddystone, and that may be said to be accomplished, that every refinement and economical arrangement has been attained, and that the progress in that direction than we at present. All these matters refer to the progress of the lighthouse—I have had no new to write to you, with the exception of that of magnetic illumination; in other respects, the same as when William Hutchinson constructed, or Rogers erected his lenses in the North Foreland lighthouse. In the meantime, the system, antagonistic to its efficiency, is now of permanent importance. The wonderful power of steam and auxiliary steam, as applied to the development of a new phase in navigation, and the channels are now traversed by this class of vessels. Voyages are made and completed with the certainty of our railway-trains. The modern times will not allow the commander of a vessel to exercise that slow caution which was the safeguard of the mariner in former years. It is not that, when all the dangerous points of our coast are indicated by lights, that this "hand-rail" of the sea would be a perfect help and security at night. Now, however, each steam-vessel carries a light which, like those of the wreckers of the coast, may only lure to destruction.

These considerations naturally lead us to revert to the question, whether our lighthouses, as at present, are near perfection as is required—

if not, in what direction are we to look for future improvement?

The English and St. George's Channels are the greatest maritime highways of the globe, their dangers and difficulties are but a type of all others, but they are better known, and moreover they are, as has been observed, as "well-lighted as Regent-street." Yet an inspection of the two charts before you will tell a tale more impressive than any words I can say. The one exhibits the localities on which total wrecks only took place in the English and St. George's Channels, during the years 1852, 1853, 1854, 1855, and 1856. The other, of similar character, shows the localities where collisions (the growing evil) have occurred during the same period. A cursory glance at these charts conveys the same sort of information as does the enumeration of the killed and wounded in some great battle, yet each figure in the one, and every black dot on the other reveals an amount of personal misery, of suffering, and the entailment of such an accumulation of sorrow and privation to thousands, that each one of them might easily form the text of a thrilling tale.

On a little closer examination a singular fact presents itself; it is, that the great majority of wrecks and collisions occur in the immediate vicinity of the lighthouses intended to guard against the dangers around them. There can be no doubt of this very important fact; and it may be readily accounted for by the universal practice of all ships, as far as possible, sailing along the coasts within sight of the lights, taking a fresh course at each point, when the general trend of the coast changes its direction. The numerous chances of error in a ship's reckoning then place it in constant peril from the proximity of the dangers it is desired to avoid. I have previously shown that our fixed structures have been pushed as far forward into the sea as human means could build them.

Many calamities have demonstrated that a mid-channel course, without very great caution, is a hazardous proceeding, especially to inward-bound ships. The reasons for this are, the varying direction and rate of the tides, which, however, are now better known and guarded against, and the local attraction of the ship herself upon her compasses. This latter unheeded source of danger has led to many losses; the mid-channel course is at right angles to the magnetic meridian, and, therefore, this element of erroneous reckoning is at its maximum. Its tendency in an up-channel course is to draw the ship's head to the southward, and hence the very numerous and distressing wrecks on the French coast, south of Boulogne, of which those of the *Reliance* and *Conqueror* may be cited as well-known examples. These disasters would have been averted had any fixed mark certified the commanders of their exact position and courses.

It is then, I believe, to floating structures we must look for future improvements in pharology. Our light vessels, as at present constructed, and as I have shown, are quite incompetent to fill any important station in the system.

The desideratum is supplied in the principle proposed by Mr. George Herbert, which I will briefly describe to you without going into those questions of wave-power and other collateral topics which may be well discussed elsewhere, or in alluding to the fallacies in principle which are at present applied to our floating beacons. The conditions required for a floating beacon are that it should keep upright to be most efficient, and for a floating light that it should, in addition to this, be free from any violent oscillation, such as is experienced by ordinary vessels. Mr. Herbert effects this by mooring his beacons which are of circular plan, from their centre of gravity, which is so arranged as to be nearly or quite on the line or plane of floatation. Beginning with the simplest form, that of a spiral buoy, as in the figure, the bottom of the body is hollowed out and raised, and the mooring attached to the upper part of the

system for distinguishing
rature which is even of the
the lighthouses were first
fact this branch of it has
from its origin.

The totally distinct character
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that derived from any other
posing that this illumination
that in present use, the
will be distinguished from
chance of mistake, the
the present lights.

Respecting the power
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light is more powerful
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as compared with the
so immense an advantage
utility for lighthouse
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In its use and
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formerly explained
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Lieut. R.
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FIG. 1.

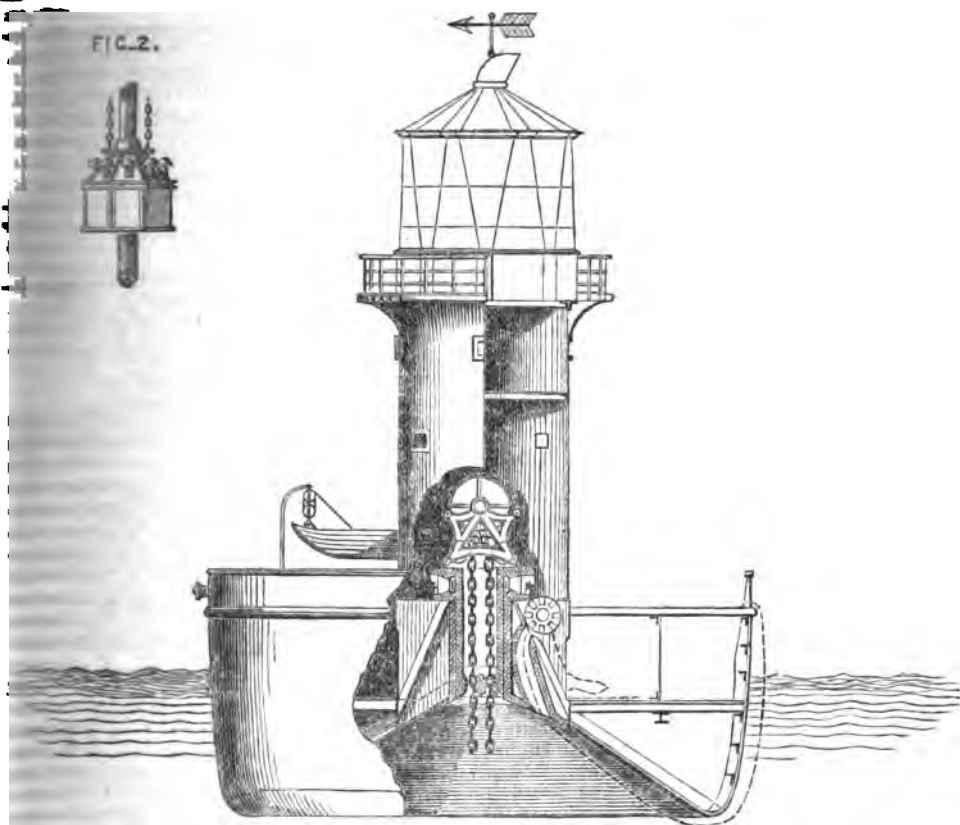


FIG. 2.



to see this principle of Mr. Herbert's practically applied to our resources for navigation. There may be hope of this, as I see in a parliamentary paper just issued, that the government authorities think it expedient and desirable that its practicability and efficiency be tested. I feel quite confident as to the result.

Now, as to its application to our lighthouse system. Mr. Herbert proposes to moor a series of these lights in a direct line up the English Channel, and a similar line up the St. George's Channel. The outer light of the former channel will be 40 miles south-west of the point, on the parallel recommended for vessels to follow for the Channel, but from which when now made, vessels are compelled to run within the reach of danger, in order to verify their position by sighting the lighthouses. At this point a line of these lights should be moored at a degree of longitude up to Dungeness, or eight lights in all for the English Channel. Although their beams will not, as proposed, overlap each other, that one will be lost sight of before the other is seen, yet they will be sufficiently near to each other for steamships to steer their course by them with the utmost confidence. The same system applies to the St. George's Channel, as will be readily understood by the diagrams exhibited.

The outermost of the floating lighthouses would communicate by electric telegraph with the shore, and thus any want or announcement would be made instantaneously in the proper quarters, without the long delays now very frequent. Many other advantages might be derived within the reach of windbound vessels by such an establishment.

It is proposed that these lights should be of one exclusive character, differing from the shore lights. Either let them all be fixed, and alter those now fixed to varying lights, but I think it would be preferable, and I now suggest it, that the electric light, with its marked distinction, would be admirably adapted to develop the utility of such a system.

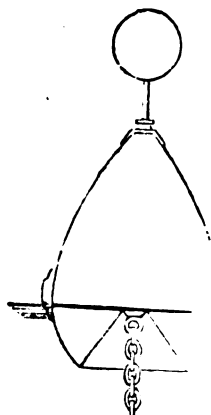
Such a line of lights once established, their utility is made manifest in a very few words. Let it be imperative, that all our steam vessels in going westward pass to the northward of those lights, and those steaming eastward, or up the Channel to the southward of them, leaving them in each case on the port hand.

These fairway lights would prove an invaluable acquisition to the mariner and the shipping interest at this period, by relieving the commander from that intense anxiety to avoid collision and danger, the chances of which now inevitably accompany his progress up these crowded channels; and we might then hope to see, in a future record of collision and wreck, a far smaller list of calamities than we now see crowded around our lighthouses.

These noble structures in all their utility would still be the safeguard of the coasting-trade, and of all ships not driven by the pressure of the times to sacrifice safety to speed.

With these remarks I close. I have endeavoured concisely to describe the past and present condition of our lighthouses, and to indicate what I believe will be the future direction for their improvement. As the talent and ingenuity of many have raised this beautiful system of applied science to its present high position, and

Such buoys were brought into use by the British in 1854, and perfectly fulfilled the end



Proceeding higher in the sea, Herbert proposes a refuge-beacon, which may be moored in those places where a seamark is imperatively necessary, and around it call for some such aid in a case of emergency. A beacon of another construction, but equally serviceable in this way on the coast, was proposed by Captain Bullock, and adopted by the Admiralty. Herbert's plan is much more simple, and may be placed outside the danger zone, without the risk which would be incurred by a beacon which would be encountered in a narrow channel. A circular base 20 feet in diameter, and 26 feet above the level of the water, the height of 26 feet, the height of the water. Around the deck of the beacon, the protection of those who resort to it. It is moored on the floating line, and in use, be of the greatest service in such situations. Such a beacon was used in 1854, on the overfall of Goodwin Sands, in a place where a ship could have lived. It was fully watched by the light-ship, who states that it had much effect on the vessel, it to cause it to roll in a short breaking sea; and that the vessel did not perceive any tugboat (the vessel had washed over its water), but never broke. A fact. It may be perpendicular, that is, the light-vessel here, side, her mast vibration at times, and at 40 deg. from the perpendicular.

But the most important principle, will be in the construction of this construction, of this construction, culty in extending within the capabilities familiar in this respect, culties far greater of the dimension

* In the River of an hour, these buoys and they are being Siam. All buoys under water by the indicated only b

had been so successfully adopted on that the slow traffic should pass by the whilst the quick traffic took the middle of such a system, the casualties of single traffic were entirely avoided.

was illustrated by numerous spe-house apparatus and ships' lamps, fr. W. C. Wilkins, Messrs. Olivers, ne. Duboscq's apparatus for the was kindly lent and shewn by Pro- of King's College. In this ar- distance between the electrodes is lockwork, controlled by a detent with an electro-magnet, acted upon current. Mr. C. W. Harrison also arrangement for producing a conic light. This is effected by con- electrode of a cylinder revolving, me time, having a motion parallel The other electrode is fixed, and is successively opposite a fresh por- cylinder.

etary announced that on Wednesday et, March 10, a paper, by Mr. Henry "On Cotton: its Cultivation, Manu- Uses," would be read.

SOULAGES COLLECTION.

ing is the petition which is about to be Parliament, by the Royal Institute of Arts, in favour of the purchase of this collection:—

Honourable the House of Commons in Parliament assembled.

humble prayer and petition of the President Council of the Royal Institute of British Architects, incorporated 7th William IV.)—

—That whereas a certain Collection of Works of Vertu, commonly known as the Soulages, has been brought to this country at the sole risk of certain patriotic individuals, moved its dispersion, and to enable it to be secured national museums, at a moderate price, which ve no profit to those individuals, who alto- pudiate the desire for any gain, provided that tion be acquired and kept together for purposes instruction in this country.

whereas the Council of the aforesaid Institute of Architects, immediately on the arrival of the collection in this country, appointed a committee of re of the said Institute, eminently qualified to e the artistic value of the objects forming the collection, to examine and to report upon the same. t, whereas the said committee, after diligent in- and examination, made an unanimous report, rrectly recommending the expediency of a pur- of the said collection for national purposes, and forth the great benefits that would, in their accrue to the art and industry of this country purchase.

whereas the Council of the said Royal Institute of Architects did receive and unanimously adopt which they caused to be read at an meeting of the said Institute, held on February, in the year of our Lord one hundred and fifty-seven, when it was re- adopted, and copies of it directed to

be forwarded to the principal members of Her Majesty's Government.

That, whereas the aforesaid Council and Committee of the aforesaid Institute, moved by their great anxiety that the said collection should not be dispersed, when the valuable and beautiful objects of which it consisted would be lost for purposes of general study and national improvement, but that it should be acquired by Government, in order to be exhibited gratuitously to the public, and to afford at all times a treasury of instruction to artists and workmen, did, on the sixteenth day of December, in the year of our Lord one thousand eight hundred and fifty-seven, attend as a deputation upon the Right Honourable the Lord President of the Committee of Privy Council on Education, to urge upon him most strenuously the important interests they conceived to be affected by the question of the said purchase.

And whereas your petitioners conscientiously believe that benefits, greatly outweighing any consideration of the sum of money to be expended in the purchase of the said collection, would speedily result to the development of the great commercial interests connected with the progress of art-industry in this country, in the event of the said purchase being effected.

This petition now, therefore, humbly prayeth, that your Honourable House will be pleased to take these matters into your gracious consideration, and devise such steps and proceedings as may cause the said collection to be purchased and freely exhibited for the benefit of the community at large, and of those more immediately connected with arts and manufactures in particular.

And your petitioners, as in duty bound, will ever pray.

(Signed)

DE GREY, President.

C. C. NELSON,

M. DIGBY WYATT, } Hon.

Secs.

16, Lower Grosvenor-street, London.

SOUTH KENSINGTON MUSEUM.

During the week ending 27th Feb., 1868, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days, 3,519; on Monday and Tuesday, free evenings, 3,912. On the three Students' days (admission to the public 6d.), 975; one Students' evening, Wednesday, 344. Total 8,750.

Home Correspondence.

THE SEWAGE OF LONDON.

SIR,—Mr. Allnutt having mentioned my name, in his paper on "The Sewage of London," in a recent number of the *Journal*, I hope you will allow me space for a few remarks on this important subject. The sewage problem embraces two questions, quite distinct, yet closely connected—1. How is the nuisance arising from the decomposition of organic matter to be got rid of? and 2. How is the waste of fertilising matter, from the escape of sewage into rivers and the sea, to be prevented? Both questions are, I believe, satisfactorily answered in the plan which I submitted to the government referees on Metropolitan Drainage, and which was printed by them in the appendix to their report. In this plan it is proposed to effect the complete and immediate removal of the excrements of the population, by means of the smallest sufficient quantity of water, through a system of earthenware pipes, laid down for the purpose, to force this concentrated sewage through pipes into the country, and to distribute it there in the way recommended by Mr. Chadwick.

The nuisance arising from sewage is occasioned by the decomposition of excrementitious matter, and this again is in great measure owing to the retention of the m-

solid part of the sewage in ill-constructed house drains and sewers. By removing all excrementitious matter immediately and completely, and placing it in contact with the soil before decomposition takes place, all the evils that arise from the decomposition of organic matter, under, or in the neighbourhood of, human habitations, are avoided.

Again, by reducing the water in which the excrements are suspended, to the smallest quantity by which their complete removal can be effected, we get rid of the great obstacle to the utilization of sewage, its great bulk and low value. If we take the daily supply of water to the inhabitants of London at 25 gallons per head, and leave the rainfall out of view altogether, the average annual amount of sewage per head will be 40 tons, and as these 40 tons of sewage contain a quantity of fertilising matter worth 6s., the value per ton is only 1½d. But it costs 2d. per ton to distribute sewage according to Mr. Chadwick's plan, consequently the utilization of sewage of this degree of strength, or weakness rather, is impossible, and, if we dilute the sewage still further, by the addition of 40 tons of rain-water, it becomes doubly impossible. Suppose, now, that by using one gallon of water per head per diem, we can sweep the excrements of the population through the earthenware pipes we have laid down, the annual amount of this concentrated sewage would not much exceed two tons per head, and its value would rise to 8s. per ton, from which the expense of distribution, supposing it to amount even to 6d. per ton, would form a trifling deduction.

The referees, in their report, state some objections to "the proposed construction of a system of drains for house sewage, and another system for rainfall," which, as they may be brought against this plan, deserve to be noticed here. The first objection is that the water which flows from the streets of London contains foul organic matter to a serious extent, that there is no such difference between metropolitan surface-drainage and house-sewage, as to justify the one being removed from the river, while the other is still permitted to flow into it. Also, that the rain falling on the roofs and yards of buildings, is subject to a vast amount of contamination, that much objectionable matter is washed out of the yards of manufactories, and from the various stables, mews, cowhouses, and other places during rain; that quantities of slops are discharged into the house gutters, and that the water-closets are in many houses connected with the rain-water pipes. Now, if we examine Professor Way's analyses of street-drainage water, we find that the quantity of soluble organic matter contained in it is so small as not to be stated separately. It appears also, from his examination of water collected from the roofs of houses, that water thus collected in London is of half the impurity and half the hardness of Thames water, and that the small quantity of soluble matter which it contains, consists principally and almost wholly of sulphate of lime. (Appendix iii. to report of General Board of Health, on Supply of Water to the Metropolis, p. 142.) We may therefore safely assume with Mr. Lawes (*Journal*, vol. iii, p. 264) "that the great bulk of the excrements of horses, cows, &c., in the metropolis, will not find its way into the sewers; that the refuse of manufactures, valuable as manure, which will do so will be comparatively limited, and that the matters abraded from the streets, with their small admixture of the excrements of horses and other animals, will also be of comparatively little value" or importance. The second objection, founded on the difficulty of introducing a fresh system of drains from the large number of gas and water pipes under the streets, and the numerous cellars, vaults, and works of similar construction, has been met by Mr. Alcock. The third objection is the expense and difficulty of constructing separate drains, and ensuring a separation. If this plan succeeds only to the extent of the receipts covering the expenditure, this objection falls to the ground. Difficulties will have to be met and over-

come whatever plan is adopted, but the difficulties attending this plan, are at least not more formidable than those attending any other.

We now proceed to state some objections to the plan proposed by the referees.

1. This plan does not meet the requirements of the Act, by which it is provided that the Metropolitan Board of Works "shall make such sewers and works as they may think necessary for preventing all or any part of the sewage within the metropolis from flowing or passing into the river Thames, in or near the metropolis." And the said Board shall cause the sewers vested in them to be constructed, covered, and kept, so as not to be a nuisance or injurious to health." The Act recognizes two sources of nuisance and injury to health,—the pollution of the Thames, and the deposit of decomposing organic matter in the sewers. This plan deals only with the former. The Act requires works to be constructed for preventing any part of the sewage of London from passing into the Thames. The referees are of opinion that a sufficient provision will have been made for rainfall in the urban districts, if the sewers of those districts are made capable of removing two-fifths of an inch of rain during the eight hours of maximum flow. They are of opinion that an amount of dilution equal to six times the maximum flow of the sewage, is the lowest point at which it is advisable to admit storm waters into the river. Unfortunately, it happens that when a fall of rain causes a flow of mingled rain water and sewage, equal to six times the maximum flow of sewage in dry weather, the resulting mixture instead of being diluted and, consequently, weaker than ordinary sewage, is much stronger. It was found in one case to contain more than double, in fact, nearly three times the amount of impurity contained in specimens of ordinary sewage. Suppose after a month's dry weather a thunderstorm takes place, and an inch of rain falls in an hour, as sometimes happens, the channels provided by the referees are incapable of removing one-fifth of the water that runs into the sewers; the remaining four-fifths are discharged into the Thames, carrying in suspension an amount of decomposing organic matter exceeding that contained in a month's ordinary sewage. The consequent pollution of the river, when it occurs, is none the less disagreeable or injurious to health, that, after an expenditure of six millions of money, it occurs only at intervals.

2. This plan cannot be carried out without great risk to the health of the inhabitants of the metropolis. "The construction alone of these sewers and their numerous tributary branches," says Dr. Copeland, "must prove a most serious matter to the inhabitants of the streets through which they are carried. The trunks especially must be both deep and large, and, consequently, the quantity of earth saturated with, and rich in the product of, animal decay, through the lapse of centuries, that will be thrown up during these constructions, and exposed to the action of the atmosphere and to the influence of the sun, must be productive of terrestrial emanations, calculated to generate a fatal typhoid epidemic of long continuance. London will be as deeply, more generally, and not less fatally, cut up into trenches than the grounds surrounding Sebastopol." (On the Drainage and Sewage of London and Large Towns.)

3. This plan will create a nuisance rivaling that which it is intended to prevent. The reservoirs, the 18-mile streams of sewage, covered or uncovered, will not smell very sweet.

4. The plan contains no provision for the utilization of the sewage. It takes away any remaining chance of its being utilised, by diluting it still farther. A velocity of two feet six inches is required in the outfall channels to prevent deposit. This velocity, however, could not be maintained unless the channel were nearly full of water; but the amount of the maximum flow of the sewage during dry weather is not much more than one-sixth of the quantity to be removed during rain. We propose, therefore, to obtain from the Thames at high

water the necessary quantity to fill the outfall channels during those times when the flow of sewage is not sufficient to give the required depth and consequent velocity. —(Report, p. 34.) The sewage which in dry weather is worth, as we have seen, seven farthings per ton, comes, when diluted with six times its bulk of water, to be worth just one farthing per ton, and will continue to flow into the German Ocean.

To sum up, the plan of the Government referees does not ensure the complete purification of the Thames; it leaves the sewers of the metropolis in *status quo*—that is, in dry weather accumulating deposits of foul organic matter, which the first heavy rain washes into the river as before; it does ensure that the loss of fertilising matter, to the value (as they say) of £1,000,000 sterling per annum, shall continue.

The plan which I have proposed, on the other hand, contains a remedy for both evils—the evil of nuisance, and the evil of waste. The utilisation of the sewage, the purification of the Thames, and the effectual drainage of the metropolis, are all provided for, and—the sewage problem is solved.

I am, &c.,

ALEX. LESLIE.

Turiff, Aberdeenshire.

NEW ZEALAND AND ITS RESOURCES.

SIR.—In the discussion on Mr. Stones' paper, given in the *Journal* of last week, I am reported to have said, "The reason why the New Zealand flax had been so little taken up was, from the fact that it came over heckled, and the yellow bark which had a deteriorating effect upon ropes made from it was not got rid of." It should have been, "The reason why New Zealand flax had been so little taken up was, from the fact, that when heckled only, the yellow bark, in a great measure, remained, so that a three-inch rope with the bark-like substance on would only make a two-inch rope if properly cleaned."

I am, &c.,

E. W. TRENT.

Brookby's-walk, Homerton, March 2, 1858.

DISEASED BEERS.

SIR.—The above heading having just caught my eye in the *Journal of the Society of Arts*, I may be excused for making a remark or two upon it. The use of the products of sulphur for brewery utensils is by no means a new thing, as I myself used it very largely some 25 years since—that is, diluted sulphuric acid, which was applied to a large quantity of butts about to be taken down, without any certainty as to when they might be required to be put together again. The plan answered thoroughly; but, how far it would be wise or prudent to use, for casks or brewery utensils generally, such a process, must be left to the judgment and taste of those more immediately concerned.

As it is well known that I have given many years' study to the seasoning of all kinds of wood, and brewers' casks as well, I trust I may be excused for saying, as regards the latter, that a rapid current of highly-heated air to the inner surface, according to the plan which met with the "golden" approval of the Society of Arts eight or nine years ago (and which, I may add, has been successfully applied to many millions of casks since that period), is much safer, cleaner, and altogether better than placing in the hands of perhaps careless labourers the use of any such element as that already referred to.

I am, &c.,

ROBERT DAVISON.

1, London-street, City, Feb. 24, 1858.

To Correspondents.

The members of the Pottery Mechanics' Institution, Hanley (late Shelton), Staffordshire Potteries, wish it to be notified that

they still agree to an "Interchange of Privileges" with other Institutions.

Mr. Theophilus Heale, of 117, Bishopgate-street-within, wishes to contradict the statement made by Mr. Stones, in his paper on New Zealand, to the effect that the works at the copper mines of the Great Barrier Island are not being carried on. Mr. Heale states that they have never been suspended for a single day since they were undertaken by himself and Mr. Whitaker in 1851, and that he considers the yield satisfactory.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 23rd, 24th, 25th, and 26th February, 1858.

54. Metropolitan Police—Accounts.

55. 1. Trade and Navigation—Accounts (31 Jan., 1858).

56. East India (North Western Provinces, &c.)—Return.

58. Schools (Scotland)—Returns.

MEETINGS FOR THE ENSUING WEEK.

- Mon.** Medical, 5. Anniversary Oration.
Architects, 8. Rev. J. L. Peia, "Remarks on Byzantine Churches."
Geographical, 8½.
- Tues.** Royal Inst., 3. Prof. Huxley, "On Biology."
Syrro-Egyptian, 7½. Mr. Jon. Bonomi, "On the Identification of certain Musical Instruments represented in the Sculptures of Nineveh, with those mentioned in the 3rd Chapter of Daniel, and in the 150th Psalm."
Civil Engineers, 5. Renewed Discussion, "On Submerging and Repairing Telegraphic Cables."
Med. and Chirurg., 8½.
Zoological, 9.
- Wed.** Literary Fund, 2. Anniversary.
Society of Arts, 8. Mr. Henry Ashworth, "On Cotton: its Cultivation, Manufacture, and Uses."
Geological, 8. I. Mr. Rodaway, "Notes on the Gold Fields of Victoria, &c." II. Mr. Phillips, "Notes on the Gold Fields of Southern Australia." III. Mr. A. R. C. Selwyn, "On the Geology of the Gold Fields of Victoria."
Graphical, 8.
Archæological Assn., 8½.
- Thurs.** Royal Soc. Ldn., 8½.
Royal Soc. Ldn., 6.
Antiquaries, 8.
Royal, 8½.
- Fri.** Astronomical, 8.
Royal Inst., 8½. Dr. W. B. Carpenter, "On the Lowest (Higwood) Type of Animal Life, considered in its relations to Physiology, Zoology, and Geology."
- Sat.** Royal Inst., 3. Prof. Huxley, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Feb. 26, 1858.]

Dated 26th January, 1858.

98. C. Davage and T. Davage, Sheffield—Improvements in railway crossings.
Dated 28th January, 1858.
152. F. Busell, 33, Cannon-street—An improved railway carriage. (A com.)
Dated 6th February, 1858.
223. G. Davies, 1, Serle-street, Lincoln's-inn—Improvements in the preservation of meat and other animal and also vegetable substances. (A com.)
Dated 9th February, 1858.
244. B. B. Wells, 431, Strand—Improvements in apparatus for counting and indicating numbers.
245. R. Carte, 20, Charing-cross—Improvements in clarinets.
246. E. Stevens, Cambridge-road—Improvements in machinery for preparing dough, paste, and like articles.
Dated 10th February, 1858.
249. G. J. Ping, Chard, Somerset—Improvements in machinery for the manufacture of hobbin net and netted fabrics.
250. R. Aytoun, Edinburgh—Improvements in safety cages or apparatus for mines.
251. W. Palmer, Sutton-street, Clerkenwell—Improvements in lamps.
252. J. Chatterton, Devonshire-street, Islington—An improvement in electric telegraph wires, and in insulating telegraph wires.
253. J. Nasmyth, Lille, France—Improvements in the mode of obtaining motive power, and of applying it.
Dated 11th February, 1858.
254. A. Chambers, Canterbury, and W. H. Champion, Lynsted Kent—Improvements in railway breaks.

Arts.

1858.

Council was held on
to consider the
week's *Journal*,
Exhibition in 1861.
whole evening, and
day, the 24th inst.,
specially summoned.

EXHIBITION OF 1858.

articles intended for
the 16th, Friday the
10th inst., and no articles
last of these days.
accompanied with a brief
invention, for insertion
a wood block (when pos-
and a reference to any pub-
vention is described.
must be framed.
space, and the Exhibition

CTIONS, 1858.

appointed the following gen-
Examiners for the present

- Rev. Alexander Wilson, M.A.,
National Society, London.
- John Ball, Esq., of the firm
of Messrs. Quilter and Ball.

MATHEMATICS.

- Rev. Harvey Goodwin, M.A.,
Cambridge.
- Rev. B. Morgan Cowie, M.A.,
Professor of Geometry at
Gresham College; one of
H.M. Inspectors of Schools.
- William Spottiswoode, Esq.,
F.R.S.

PHYSICS.

- Nautical { John Riddle, Esq., F.R.A.S.,
Head Master of the Nauti-
cal Schools, Greenwich.
- namics, Hy- { Rev. A. Bath Power, M.A.,
Principal of the Diocesan
Training School, Norwich.

- Practical Mechanics { T. M. Goodeve, Esq., Profes-
sor of Natural Philosophy,
King's College, London.
- Magnetism, Electricity,
and Heat..... { Charles Brooke, Esq., M.A.,
F.R.S., Surgeon to the West-
minster Hospital.
- Astronomy { Rev. Baden Powell, M.A.,
F.R.S., Savilian Professor of
Geometry in the University
of Oxford.
- Chemistry { Dr. A. W. Williamson, Pro-
fessor of Chemistry, Univer-
sity College, London.
- Animal Physiology { William Sharpey, Esq., M.D.,
F.R.S., Examiner in Uni-
versity College, London.
- Botany { Arthur Henfrey, Esq., F.R.S.,
Professor of Botany, King's
College, London.
- Agriculture J. C. Morton, Esq.
- Political and Social Eco-
nomy { Charles Neate, Esq., M.A.,
Professor of Political Eco-
nomy in the University of
Oxford.
- Descriptive Geography... Wm. Hughes, Esq., F.R.G.S.
- Physical Geography..... { Rev. Samuel Clark, M.A.,
F.R.G.S., Principal of the
Training College, Battersea.
- English History..... { E. S. Creasy, Esq., M.A.,
Professor of History, Uni-
versity College, London.
- English Literature { Rev. F. Temple, M.A., Head
Master of Rugby School.
- Latin and Roman History { F. R. Sandford, Esq., B.A.,
Assistant Secretary to the
Committee of Council on
Education.
- French { Alphonse Mariette, Esq.,
M.A., Professor of French,
King's College, London.
- German { Dr. Bernays, Professor of Ger-
man, King's College, Lon-
don.
- Freehand Drawing..... F. S. Cary, Esq.
- Mechanical Drawing..... { Thomas Bradley, Esq., Pro-
fessor of Geometrical Draw-
ing, King's College, London,
and Master at the Royal
Military Academy, Wool-
wich.

EXAMINATIONS.—LOCAL BOARDS.

The Committee of the London Mechanics' In-
stitution have passed the following resolution:—

"That the Local Board of the London Mechanics' In-
stitution, Southampton-buildings, is prepared to under-
take the previous Examination of Candidates from any
Society in Union with the Society of Arts not having a
Local Board of its own."

ARTISTIC COPYRIGHT.

A Report as to the existing English Common
and Statute Law, relative to this subject

255. L. Cass, Bury—Improvements in steam engines and steam engine boilers, and in apparatus connected therewith. (A com.)
256. R. Bell, Gracechurch-street—An improvement in stable pans, sinks, and urinals.
257. G. A. Barrett, W. Exall, and C. J. Andrewes, Reading—An improvement in the manufacture of perforated beaters for thrashing machines.
258. B. Looker, Junr., Kingston-on-Thames—Improvements in sockets for receiving telegraphic and other posts or uprights.
260. G. W. Burton, Dubuque, Iowa, U.S.—An improved method of manufacturing white lead. (A com.)
261. J. R. W. Atkinson, Leeds—An improved mode of tightening up an unscrewing binding nuts and screws.
262. W. Keatinge, Merrion-square, Dublin—Improvements in correcting variations in the mariner's compass from local attraction.
263. G. Thorington, Old Windsor—A novel method of propulsion, applicable to agricultural purposes.

Dated 12th February, 1858.

264. W. N. Wilson, 144, High Holborn—Improvements in machines for cleaning and polishing knives. (A com.)
265. W. N. Wilson, 144, High Holborn—Improvements in washing and wringing machines. (A com.)
266. J. C. Fisher and J. Booth, Blackburn—An improved mode or method of driving mule spindles.
267. J. Horsey, Greek-street—An improvement in india rubber and other elastic band or ring fastenings.
268. J. Clifton, New Oxford-street—A new article of nursery furniture or gymnastic exercising chair and support for children. (A com.)
269. T. Neville, Lichfield, and W. S. Dorsett, Aldridge, near Walsall—Improvements in steam boilers or steam generators, and in steam engines.
270. T. Neville, Lichfield, and W. S. Dorsett, Aldridge, near Walsall—A new or improved method of constructing and actuating horizontal water wheels.
271. A. V. Newton, 66, Chancery-lane—An improved construction of sewing machine. (A com.)
272. A. V. Newton, 66, Chancery-lane—Improved machinery for stitching or working button-holes. (A com.)
273. W. C. T. Schaeffer, Stanningley, near Leeds—Improvements in obtaining fatty and oily matters from wash waters, or waters containing soap.
274. J. Macintosh, North Bank, Regent's-park—An improvement in treating articles of gutta percha made or formed in dies or moulds, also certain articles of gutta percha made by expressing through dies, and also articles of gutta percha made by pressing rollers.

Dated 13th February, 1857.

276. J. E. Ryffel, Wimbledon—The improvement of stoves, for the purpose of warming rooms and baking bread, called the "hygean stove."
277. J. C. H. Sierler, Upper Holloway—Improvements in submarine conductors of electric telegraphs.
278. E. D. Johnson, Wilmington-square—An improved construction of chronometer case.

Dated 15th February, 1858.

279. W. Spence, 50, Chancery-lane—Improvements in tele apparatus. (A com.)
280. J. McDermid and J. McDermid, Oak Tree, Middle-row, near Darlington—An improved apparatus for supplying water to buildings and dwellings for sanitary purposes, and for the extinction of fires.
281. P. M. N. Benoit, Paris—An improvement in controlling the pressure exerted by the steam against the pistons of steam engines of all kinds.
282. E. Hunt, Walnut-tree-walk, Lambeth—Improvements in voltaic batteries, and in means for producing electricity.
283. G. T. Bousfield, Loughborough park, Bricklayers-square—Improvements in the preparation of dough for bread, pastes, and other farinaceous articles of food. (A com.)
285. J. Tall, 150, Blackfriars-road—Improvements in the construction of carriages called perambulators.
286. M. Crawford, Elswick Iron Works, Newcastle—Improvement in the manufacture of iron plates.
287. G. L. Blyth, Derby-street, Parlane—Improvements in the manufacture of machines for mixing and other fluids containing ammoniacal salts.

288. W. Cope, Nottingham—Improvements in the manufacture of fabrics by bobbin-netting.
289. H. J. Sanders and S. Thacker—Improvements in the machinery for the manufacture of paper.
290. W. E. Newton, 66, Chancery-lane—Improvements in certain oils and fats, and in the treatment of such oils and fats.
291. J. Garnett, Otley—An improvement in the construction of steam engines.

Dated 16th February, 1858.

293. H. Wilde, Manchester—Improvements in the construction of ends of lightning conductors and electric telegraph cables.
294. W. Armitage, Manchester—Improvements in the construction of pencils.
295. T. B. Daft, Liverpool—Improvements in the construction of out pencil marks.
296. M. A. F. Monahan, 4, St. James's-street—Improvements in the construction of laying submarine cables.

Dated 17th February, 1858.

300. J. E. Boyd, Hitherston—Improvements in the construction of and grass mowers.
301. G. Baker and J. H. Baker—Improvements in the construction of machinery for compressing.
302. P. Heyns, 2, Victoria-street—Improvements in the construction of and axle-boxes.
303. R. Varvill, Hitherston—Improvements in the construction of washing clothes.
304. W. Riddle, 4, St. James's-street—Improvements in the construction of articles of iron.
305. The Hon. W. R. Peel—Improvements in the construction of shirts.

1857.

248. W. S. ...
259. ...

WEEKLY LIST

No. in the Register.	Date of Registration.	
4060	Feb. 22.	Improvements in the construction of
4061	" 24.	A Box of
4062	" 26.	
4063	M.	

"The Council are always glad to receive, from the Directors of any Institution in Union with the Society of Arts, suggestions for increasing the advantages which the Society can impart to the Institutions; and the Council can neither expect nor desire that any Institution shall remain in the Union without receiving, directly or indirectly, a full equivalent for its annual payment of £2 2s. to the Society's funds.

"It should, however, be borne in mind, that the existence of the Union confers a *prestige* and an increase of strength upon the Institutions.

The very valuable provisions of the "Literary and Scientific Institutions Act, 1854," (17 and 18 Vict., c. 112) would never have been enacted if the Union had not existed. The members of the Institutions in the Union, when absent from their own neighbourhoods, can obtain access to nearly all of the other Institutions which the Union comprises; and, when in London, can attend the discussion meetings and lectures, and visit the exhibitions, of the Society of Arts, on the same terms as the Society's members. The *Journal* is supplied weekly, without charge, to each of the Institutions; they are supplied occasionally with specimens, photographs, and other articles, for temporary exhibition; they can purchase books, maps, and scientific apparatus at considerably reduced prices; they may confer on their members, as well as on their regular students, the advantages of admission to compete in the Society's examinations for certificates and valuable prizes; and they are furnished with arranged catalogues of lecturers, their addresses, subjects, and terms. The Council of the Society of Arts do not at all desire that all the Institutions in the Union shall be managed on the same plan, and promote exactly the same objects. A great diversity of objects and plans exists among them. The Council do not undervalue a well-arranged system of lectures; and, in the first years of the Union, the Council took much pains to assist the Institutes in this direction. The Council endeavoured to get the Institutes to make, or to enable the Society to make for them, combined arrangements with lecturers, with a view to the reduction of their traveling and other expenses, in order that the cost might be less to the Institutes. The Council hoped that such arrangements might be made, with mutual advantage to the Institutes and to the lecturers; but the Institutes could not be got to combine, and to agree, for this object; and the Conference of the Representatives of the Institutions came to the conclusion that nothing could then be done for them by the Society, in the matter of lectures, except to supply them with the arranged catalogues above-mentioned. It should be added, that the information which the Council have received from many quarters has tended to the conclusion that a large number of the Institutions are giving up lectures as unpopular and unfruitful of good results.

The Council, however, are of opinion that lectures, if they can be placed on a good footing, are not to be despised; and, if the representatives of the Falkirk School of Arts will bring this subject before the Conference, in June next, the subject shall have the best consideration which the Council can give to it. Nothing beneficial can be done, without the effective co-operation of a considerable number of Institutes.

Having made these explanations, the Council cannot but express their hope that the Falkirk School of Arts will find itself in a position to take an influential part in the very important educational work which is now extending itself throughout the Union in connexion with the Society's Examinations.

It is generally agreed, among the friends of popular education, that it is of the greatest possible moment to furnish motives and means for the continuance of instruction among the poorer classes, after the children have left their elementary schools. Such means are found not so much in lectures as in evening schools.

GEORGE HAMILTON, M.D.,
Secretary.

the reply of the Council:—

Society of Arts, Adelphi, London,
10th March, 1858.

Resolved by the Council of the Society of Arts, Manufactures, and Commerce, that the resolutions passed by the Falkirk School of Arts, on the 10th March, 1858, have been very carefully considered.

been prepared at the request of the Committee, by D. Robertson Blaine, Esq., Barrister-at-Law, Reporter to the Committee, and may be obtained of the Society's publishers, Messrs. Bell and Daldy, Fleet-street. Price sixpence.

EXAMINATION PRIZE FUND FOR 1858.

The following circular letter has been addressed to the Members of the Society:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., Jan. 30, 1858.

SIR,—I am instructed by the Council to inform you that the Examination Prize Fund for 1858 is now opened. The donations for 1857 were contributed by twenty-three Members, and there is a small balance to carry forward.

The Council draw attention to the fact, that last year's Examinations were limited to two centres. At these two centres, pupils from thirty-seven Institutions only presented themselves; ten of them were from the metropolitan district, London being one centre; sixteen from Yorkshire, Huddersfield being the second centre, leaving but eleven for all England, Ireland, Scotland, and Wales. This unequal distribution was one of the reasons which satisfied the Council that the system was not adapted to meet the wants of all the Institutions. They, therefore, resolved to bring the Examinations to the very doors of the Institutions, by such step of course throwing open the prize fund to the students of every Institution.

The Council have also decided on contributing a certain mileage towards the travelling expenses of those candidates who desire to receive personally and publicly their prizes, and also £5 towards the travelling expenses of each pupil, who, obtaining three of the Society's certificates of the first class in the subjects contained in the Oxford programme, is desirous to contend for the degree of Associate at the Oxford Examinations. These changes lead the Council to believe that a considerably larger sum than last year will be required for the prizes, and I am, therefore, instructed to draw the attention of all the members to the circumstances.

Donations can be remitted to Mr. Samuel Thomas Davenport, Financial Officer, Society of Arts, Adelphi, London, to whom Post-office Orders should be made payable.

I am, Sir, your obedient servant,
P. LE NEVE FOSTER, Secretary.

The following is the list of Donations up to the present date:—

T. D. Acland, Member of Council.....	£ 5 5
John Ames.....	5 5
J. G. Appold, Auditor.....	10 10
T. H. Bastard.....	5 0
B. L. Chance.....	5 5
Harry Chester, Vice-Pres.....	10 10
Henry Cole, C.B., Vice-Pres.....	1 0
H. D. Cunningham, R.N.....	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation).....	10 10
Thomas Dixon.....	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.....	5 0
Lord Ebury.....	5 0
J. Griffith Frith, Member of Council.....	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation).....	10 10
F. Seymour Haden (annual).....	2 2
William Hawtsworth.....	1 1
Edward Highton (annual).....	2 2
James Holmes (annual).....	1 1
The Marquis of Lansdowne, Vice-Pres.....	20 0

George Lowe, F.R.S.....	1 1
The Master of the Mint, Member of Coun- cil (second donation).....	10 10
Sir Thomas Phillips, Member of Council...	5 5
William T. Radford.....	1 1
Charles Ratcliff, Hon. Local Sec. (annual)...	10 10
Arthur Trevelyan.....	1 0
T. Twining, jun., Vice-Pres.....	10 10
Dr. J. Forbes Watson.....	1 1
G. F. Wilson, F.R.S., Member of Council (third donation).....	10 10

FALKIRK SCHOOL OF ARTS.

The following letter has been received from the Falkirk School of Arts:—

SIR,—At a meeting of the Directors of the Falkirk School of Arts, held on February 10, 1858, the following resolutions were unanimously adopted, and were ordered to be transmitted to the Secretary of the Society of Arts, London.

1. The Directors wish to remark, that the controversy which has recently occurred, connected with the system of Examinations in Institutions where class instruction exists, has caused their attention to be directed to the position and objects of the Institution with which they are more immediately connected, and to the relation which it holds, and the advantages which it derives, or might derive, from its connection with the London Society of Arts. The remark made in the circular from the latter, dated December 4, 1857, seems to the Directors of this Institution one of great importance, viz., that "the funds contributed by the Institutions in London ought to be so expended by the Council of this Society as to afford to all parts of the Union, as far as possible, an equal amount of advantage." In unison with this sentiment the Directors of the Falkirk School of Arts would remark, that the principal object of the Falkirk School of Arts, since its commencement in 1837, has been to furnish to the inhabitants of the town and surrounding district annual courses of lectures on subjects of a literary and scientific character. At first these were, to a considerable extent, of a kind suited to the tastes and wants of mechanics. Gradually, however, it was found that the support given by this class to the Institution was too limited to enable it to exist, and the lecturers employed had to be changed—more of a generally popular element being studied in their selection. With this change the Institution revived, and has for a number of years gone on prosperously. The audience now consists of a fair mixture of the public generally, a considerable proportion being ladies. A syllabus of this year's course of lectures is enclosed, to show the class of lecturers which it is necessary to employ, in order that success may be ensured. A library was also, for many years, connected with the Institution, but experience taught the Directors that this was only a burden to them; for, on the one hand, they could not procure from the members sufficient funds to afford this, on its own account, proper support, and these funds had therefore to be drawn from what was realized from lectures; while, on the other hand, the lectures on this account necessarily became less attractive from the diminished remuneration that could be given to lecturers. In attempting to do two things, therefore, neither was done well. The conviction on this point became so strong, that for many years the library, consisting of six or seven hundred volumes, was locked up without being used, and latterly the whole was presented to a public library in the town, open to the public at a moderate rate of membership.

2. It will be seen, from what has been stated, that the Directors, after the experience they have had, now consider their vocation to consist in furnishing to their townsmen annual courses of miscellaneous lectures. In order

that these shall be successful, they have become aware that two conditions are necessary, viz., very moderate prices of admission, and a preponderance of first-class lecturers. The prices of tickets, for example, are this season 3s. 6d. for adults, and 2s. 6d. for young persons, while the sums paid to lecturers are respectively £4 4s. and £3 10s. per lecture, and £10 for each musical lecture, making an aggregate for the course, exclusive of three gratis lectures, of £60 12s., a sum the Institution could not pay without the contributions of honorary members.

3. From all that the Directors have been able to learn, as well from what they see in their own neighbourhood as from the information they have obtained, and the opinions they have heard expressed by the different lecturers who have visited them, a very large proportion of the flourishing country Institutions in Union with the Society of Arts are in a situation very similar to their own. If such be the case, it must be obvious to the Council of the Society of Arts that this and similar Institutions derive little or no direct advantage from their connection with the Society of Arts, and that with such the keeping up the connection, by the annual payment of £2 2s., must eventually, under these circumstances, become a question for consideration.

4. While such, the Directors candidly state, has hitherto been their experience, they have no wish to withdraw from the Union; but they would respectfully submit to the Council of the Society of Arts, whether it would not be possible to devise some means for lessening the expense of procuring first-class lecturers, a benefit which they feel would apply to every Institution in the country. Whether this could be done they do not presume to say; it is sufficient that they have indicated their position and the difficulties they have to contend with. They may mention, however, what the lecturers themselves have often remarked to them, that if continuous engagements could, by any arrangement, be procured for really first-class lecturers, a much smaller sum than is usually given would remunerate them better than what it is at present necessary to give, especially to those coming from a distance. Whether, also, railway companies could be induced to modify their rates to lecturers on their professional visits, is also, perhaps, a subject that might engage some attention.

In conclusion, the Directors of the Falkirk School of Arts would again beg respectfully to state, that their own pretty ample experience convinces them, that Institutions like their own will find, ultimately, that the lecturing department, when well managed, is that which is most attractive, and therefore the most remunerative and the most to be depended on; that it is unfair to this department that the funds to be derived from it should be diverted to other purposes, and that, in effect, the attempt to do so, will generally be found to injure both; and that any efforts of the Society of Arts to aid the Institutions, generally, ought, in the opinion of the Directors of the Institution, to have especial reference to the procuring of first-class lecturers at a moderate rate. With such, the Directors have no fears for the success of their Institution, and without this they are afraid that it would be hazardous to ensure the continuous prosperity of any Institution, based, like their own, on the support of the public generally.

I am, &c.,

GEORGE HAMILTON, M.D.,
Secretary.

The following is the reply of the Council:—

Society of Arts, Adelphi, London,
10th March, 1858.

"SIR,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to acquaint you that the resolutions passed by the Directors of the Falkirk School of Arts, on the 10th February last, have been very carefully considered.

"The Council are always glad to receive, from the Directors of any Institution in Union with the Society of Arts, suggestions for increasing the advantages which the Society can impart to the Institutions; and the Council can neither expect nor desire that any Institution shall remain in the Union without receiving, directly or indirectly, a full equivalent for its annual payment of £2 2s. to the Society's funds.

"It should, however, be borne in mind, that the existence of the Union confers a *prestige* and an increase of strength upon the Institutions.

The very valuable provisions of the "Literary and Scientific Institutions Act, 1854," (17 and 18 Vict., c. 112) would never have been enacted if the Union had not existed. The members of the Institutions in the Union, when absent from their own neighbourhoods, can obtain access to nearly all of the other Institutions which the Union comprises; and, when in London, can attend the discussion meetings and lectures, and visit the exhibitions, of the Society of Arts, on the same terms as the Society's members. The *Journal* is supplied weekly, without charge, to each of the Institutions; they are supplied occasionally with specimens, photographs, and other articles, for temporary exhibition; they can purchase books, maps, and scientific apparatus at considerably reduced prices; they may confer on their members, as well as on their regular students, the advantages of admission to compete in the Society's examinations for certificates and valuable prizes; and they are furnished with arranged catalogues of lecturers, their addresses, subjects, and terms. The Council of the Society of Arts do not at all desire that all the Institutions in the Union shall be managed on the same plan, and promote exactly the same objects. A great diversity of objects and plans exists among them. The Council do not undervalue a well-arranged system of lectures; and, in the first years of the Union, the Council took much pains to assist the Institutes in this direction. The Council endeavoured to get the Institutes to make, or to enable the Society to make for them, combined arrangements with lecturers, with a view to the reduction of their travelling and other expenses, in order that the cost might be less to the Institutes. The Council hoped that such arrangements might be made, with mutual advantage to the Institutes and to the lecturers; but the Institutes could not be got to combine, and to agree, for this object; and the Conference of the Representatives of the Institutions came to the conclusion that nothing could then be done for them by the Society, in the matter of lectures, except to supply them with the arranged catalogues above-mentioned. It should be added, that the information which the Council have received from many quarters has tended to the conclusion that a large number of the Institutions are giving up lectures as unpopular and unfruitful of good results.

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Having made these explanations, the Council cannot but express their hope that the Falkirk School of Arts will find itself in a position to take an influential part in the very important educational work which is now extending itself throughout the Union in connexion with the Society's Examinations.

It is generally agreed, among the friends of popular education, that it is of the greatest possible moment to furnish motives and means for the continuance of instruction among the poorer classes, after the children have left their elementary schools. Such means are found not so much in lectures as in evening schools, r

Taking in like manner 1856, cotton manufactures exported	£38,284,000
The value retained for home use	23,200,000
Total value of cotton manufactured for 1856	£61,484,000
Increase in three years	£7,546,604

From the total value of cotton manufactures produced in 1856, say	£61,484,000
We have to deduct the cost of the raw material	23,958,000

Thus leaving in this country the sum of £37,426,000

being the trading advantage which has been distributed as profits, wages, rents, cost of fuel, use of machinery, interest of capital, freight, carriage, and for every article of every kind derived from the resources of the nation.

The number of persons employed in the cotton factories of the United Kingdom in 1856, was—

In England and Wales	341,170
„ Scotland	34,698
„ Ireland	3,345

Total 379,213

Every worker is considered to represent three non-workers.

The above are those employed within the factories, and they are only a small proportion of those employed in all the other branches of the cotton manufacture which are not subjected to factory inspection.

Their numbers appear small in comparison with the vast extent of their productive power, affording the most striking evidence of the triumph of mechanical art, and serving also to display the physical advantages which have accrued to the working-class from having the operations of manual labour consigned to the power of the steam-engine.

Those employed in all our woollen, worsted, linen, and silk factories, are 306,204.

The increase of population is generally considered an evidence of the prosperity of a country. This has been enormous, more especially in the principal towns and seats of industry.

Taking the county as a whole, agricultural and manufacturing, the increase has been as follows:—

Population of Lancashire, 1750	297,400
„ „ 1801	672,565
„ „ 1851	2,081,236

Thus it appears that, from a period a little before the invention of the spinning process, the population of the county, as a whole, has multiplied itself by seven.

It has been estimated that, within an area of 30 miles round Manchester, the population exceeds that of the five area around St. Paul's. All this mass of people, although not in immediate connexion with the manufacture of cotton, are ministering, in one way or another, to its requirements, in bleaching, dyeing, printing, or otherwise preparing the articles for sale, or in the distribution of them for consumption.

Other departments of trade, which are necessarily connected with the cotton manufacture, are also extensively carried on, such as the manufacture of chemical preparations, engineering, machine making, building, &c., &c.; wholesale and retail dealers of every kind, besides the numberless little trades which exist on thriving industry, in addition to the interests of agriculture and shipping. By way of survey of the advantages thus derived to Lancashire, beyond those of a trading character, let us take an estimate of the social progress of the people—review the succession of rapid changes in the aspect of the country, and the amazing increase which has taken place in the value of landed estates, coal mines, &c., perhaps unparalleled in extent in this or in any other country.

Camden, in his survey of 1607, speaks of Lancashire as lying “beyond the mountains, towards the Western Ocean,” and appears to regard it not only as a foreign, but as hardly a civilized, country. It has been in this unpromising locality that manufactures and commerce have found a genial soil, and in the hands of this race of people, so dreaded by the early historian, that the sciences of mechanics and chemistry have been applied to manufacturing industry, with a practical intelligence unrivalled, and previously unknown.

The rivers which obstructed the Norman conqueror in his march through the district of South Lancashire are now employed in propelling machinery in bleaching, dyeing, and printing our fabrics, and are crossed with bridges and viaducts, for our roads and railroads. The morasses and woods of the country have been rendered fertile by cultivation, and no inconsiderable portion of the surface has been converted into large towns and populous villages, or applied to trading purposes, yielding to the proprietors a largely increased rental. Camden also speaks of the existence of several large towns, and mentions “Litherpool,” as the most convenient and usual place for setting sail to Ireland; but there are many towns, such as Ashton, Bolton, Oldham, Salford, &c., &c., now containing from 20,000 to 100,000 inhabitants, which are not even noticed as existing.

At Liverpool, the changes, as measured by the population, are as follows, taking the Census previous to Camden's survey:—

Say	1555	Population was	138
“	1693	“	4,851
“	1760	“	25,787
“	1801	“	77,708
“	1821	“	118,972
“	1831	“	165,221
“	1841	“	223,003
“	1851	“	258,346

The above relates to the parish only, but if the adjoining townships or component parts of the town are included, the population will be 376,065, besides about 12,000 seamen. The increase of merchandise and shipping has been equally progressive.

Year.	Vessels.	Tonnage.
1764	1,625	Not stated.
1800	4,746	450,060
1810	6,729	734,391
1820	7,276	805,033
1830	11,214	1,411,964
1840	15,998	2,445,708
1850	20,457	3,536,337
1857	23,032	4,645,362

The increase in the value of property is universal. We will therefore take the county as a whole, including land under cultivation and waste, as well as towns, and referring to the land-tax returns of 1692, the annual value was £97,242. The valuation of 1853 for county rate was £6,913,073, showing an improved value of 7,000 per cent. The hundred of Salford, taken by the same valuation, shews in—

1692 the sum of £	25,907
1853 „ „	3,051,347

Or an increase of value of 11,700 per cent.

Without selection of individual towns we will take some of those which Camden does not appear to have discovered:—

	Annual Value in 1692.	Annual Value in 1853.
Ashton	£1,345	£150,370
Bolton	301	143,080
Oldham	287	119,669
Salford	809	159,328
Total	£2,742	£572,397

Or an increase of nearly 21,000 per cent.

THE
COTTON
TRADE
IN
LANCASHIRE
AND
CHESHIRE

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The cotton trade in Lancashire and Cheshire is one of the most important in the world. It is a trade which has been growing steadily for many years, and it is one which is likely to continue to grow for many years to come. The cotton trade in Lancashire and Cheshire is a trade which is based on the production of cotton cloth. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest.

Passing from the districts of Lancashire to those which surround the kingdom which have produced the most important influence of the cotton manufacture, we may turn to Glasgow as next in importance. While the leading branch of the cotton trade of Lancashire is mainly concerned with the more substantial articles of clothing that of Glasgow has excelled in fine apparel and in the

THE COTTON TRADE IN LANCASHIRE AND CHESHIRE. The cotton trade in Lancashire and Cheshire is one of the most important in the world. It is a trade which has been growing steadily for many years, and it is one which is likely to continue to grow for many years to come. The cotton trade in Lancashire and Cheshire is a trade which is based on the production of cotton cloth. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest. It is a trade which is based on the production of cotton cloth of all kinds, from the finest to the coarsest.

In the whole of the country there more coal and

of embroidery. About the year 1790, the weaving of fine muslins, in imitation of the book muslins of India, was introduced into this city, and has increased rapidly; afterwards, other fancy fabrics of the loom followed in succession, and the dyeing of Turkey red has come a very extensive and important branch of the cotton business. Calico printing has also been extensively cultivated, and the printed shawls of Glasgow are elaborate productions, and are supplied at a cost which is believed to favour the million as consumers.

The embroidery of muslins, or the "sewed muslin trade," has assumed great importance, and has become extended from the country districts of Scotland to the north of Ireland. It has been stated by Dr. Strang, in a paper which he read in August last, before the statistical section of the British Association, that, in the neighbourhood of Belfast, the sewed muslin embroidery trade of Glasgow furnishes employment for about 200,000 women and girls, and that the richness and beauty of this work are bestimated from the fact, that a handkerchief, the value of which costs 3s., may be rendered worth £8. The manufacture of cotton sewing thread is another branch of trade, which is extending in Glasgow and Paisley. Engineering, and other concerns of large magnitude, have been established, and the manufacture of chemical preparations, in connexion with the bleaching of cottons, is largely carried on in Glasgow as well as in Lancashire.

HOSIERY.

The hosiery branch of the cotton trade of the counties of Derby and Nottingham is most valuable and useful. The domestic part of it is not subjected to inspection as factories are, therefore the number of persons employed cannot be ascertained with accuracy, but according to an account taken in 1844 there were at that time employed from 50,000 to 60,000 hands, one-half of whom are women and children.

The statistics relating to progress are not easily found, but the extension and improvement of cotton spinning led to an extension in the manufacture of stockings, from the year 1787 when the consumption of cotton yarn was 1,500,000; to 1812, when the consumption was 3,000,000; and 1857, when it had reached 9,450,000.

The amount of profits and wages annually derived from this department of trade, was computed, in 1844, at the sum of £1,335,000, and since that period the changes have been very great and very favourable.

The price of a pair of cotton stockings may range as high as 10s., or it may descend as low as 1½d., thus forming, at an easy expense, stockings to the feet of millions of people who never before have enjoyed that comfort.

The larger part of this labour is domestic, though the greatest share of the weight of cotton yarn consumed is in the factories where cheap stockings are made.

LACE TRADE.

The machine-wrought cotton lace trade is chiefly carried on in the counties of Nottingham, Leicestershire, and Derby. The number of persons employed may be computed at from 50,000 to 60,000, of whom the greater part are women and children, and the labour is largely carried on in factories; the rest is domestic or in the finishing warehouses.

The quantity of cotton yarn consumed, in 1857, was 1,060,000 lbs., of the value of £1,400,000, and the return of profits and wages has been estimated at £1,630,000. The total return for machine wrought cotton lace was, in 1857, £3,030,000.

In the earliest account we have of this manufacture, adaptations of the stocking frame were used for the making of lace. A large portion of these machines were superseded soon after the year 1809, by the patent machines of Mr. Heathcoat. At first there arose a violent conspiracy through the ignorance of the workmen, and a great many machines were broken by the mob. The success

which has since followed may be appreciated by reference to the following facts:—

Making lace of both kinds of material, i.e., silk and cotton—

In 1815 the number of machines at work was	140
In 1856	3,500
And the total number of hands employed, 135,000, who are working upon silk and cotton inclusively.	
In 1811, the population of Nottingham was	47,000
In 1856	118,000

By reason of the superiority of these machines, and the reduction in the price of cotton yarn, the cost of a square yard of cotton lace has been reduced to from five pounds to sixpence, or nearly in a ratio of from one pound sterling to one penny.

SAMPLES SUBMITTED.

D. at 6d. per square yard; cost of 1 lb. of yarn...	2 0
Its value as plain net.....	8 0
E. at 8d. per square yard; cost of 1 lb. of yarn...	4 0
Its value as plain net.....	16 0
F. at 12d. per square yard; cost of 1 lb. of yarn...	7 0
Its value as plain net.....	24 0

The above qualities have been sold at 4s. 6d., and 8d. respectively, when the price of yarn was at the lowest point.

A. at 1s. per yard long	} cost of 1 lb. of yarn £2
B. at 1s. 6d. "	
Its value as finished lace £9	

C. at 7s. 6d. per yard long; the cost of	
one lb. of yarn.....	£17 to £20
Its value as finished lace	£170 to £200

The raw cotton for the above manufactures would cost from 1s. to 4s.; therefore, the profit and labour, use of buildings, machinery, &c., &c., upon 1lb. of cotton, has amounted variously from 7s. at the lowest to £199 16s. 0d. at the highest point of manufacture.

WORSTED MANUFACTURE.

Amongst the recent and most important of the advantages derived from cotton, has been its admixture with wool, mohair, alpaca, linen, and silk.

Of these mixed fabrics, the history of its success in the worsted trade of Bradford will be most deserving of our notice.

To begin with the origin of woollen garments, it may be remarked that, following the Roman conquest, our ancestors had begun to form their raiment from the fleece. From that time to the present, one of the leading characteristics of our progress has been luxury in dress. A succession of advances in the textile arts has introduced the wearing of every variety of animal and vegetable substance that could be fabricated by the loom.

About the time of Henry III., the art of weaving woollen stuffs had become established at a place called Worsted, in Norfolk. Afterwards the trade became settled at Norwich, where it grew into a manufacture of leading importance, and for several centuries, continued to flourish there. At length it approached the coal districts of the north, and became the staple trade of Bradford, in Yorkshire.

This manufacture of worsted stuffs served for female garments, especially for winter, and the damask for household drapery, but the wool of which it was composed did not admit of being wrought into light fabrics, such as the progress of national taste required. Hence, about 20 or 25 years ago, the prospects of this trade appeared very gloomy, so much so, that some of the manufacturers were in dread of its utter extinction. This demand for lighter fabrics in wool aroused the energies of the trade, and the

The most successful case of improved value is the township of Chorlton-upon-Medlock, adjoining to Manchester. In the year 1590 it was sold for £320; in 1644 for £300; in 1794 for £42,914; and in 1853 the annual value for county assessment was £143,151; or, according to the value of the fee simple, the increase is upwards of 50,000 per cent. in little more than two centuries.

During this extraordinary progress in the value of landed property, there have been contiguous estates which have only improved by reason of improved markets for farming produce. In such cases there may have been an absence of roads or of mines, or of native enterprise, or perhaps a disinclination on the part of the owners to allow the resources of the country to be turned to the most profitable account.

The city and suburbs of Manchester now cover a large surface. The amount of increase of population cannot be ascertained with perfect accuracy, but some idea of its extent may be formed from the following data:—

In 1757 the population of the town or town-ship was estimated at	16,000
1788	42,800
1801 Manchester, "Salford," and suburbs	109,100
1811	132,000
1821	180,000
1831	261,000
1841	320,000
1851	430,000

The population of Manchester proper has increased fourfold in fifty years, and, commercially speaking, above may be considered to represent the progress of the city as identified with the interest of cotton.

Those who have visited Manchester will have observed that the city is not devoid of natural pretensions, whether in her public or private establishments. It is not, however, in display that Manchester will require to be but in the characteristic enterprise and industry of the people. The possession of these qualities has made the city the cherished home of kindred spirits, who have thrived from distant parts of our country and abroad. The estimation of this community as well as social point of view may be formed by the fact that 2,000 German soldiers, numbers from other countries, have been sent to Manchester as the choicest field for mere cotton manufacture.

Although the cotton manufacture has spread around Manchester, it has not been so that the traces of its success are to be seen in the adjacent counties of Chester, Derby, &c. largely in its prosperity, as have been Nottingham and Leicester, and Scotland and Ireland. The social progress may not admit of illustration by the progress of those mechanical arts which may be described, and in a manner intelligible.

It may be, and probably will be, that the progress of attention to the mechanical and intellectual improvement of the progress of those mechanical arts which may be described, and in a manner intelligible.

In the absence of any indications of neglect will be seen in the department of labour, but it is evident that the classes engaged in the advance of the general intelligence, but in acquired money wages for children, and in the progress of instruction among the poor, has been attempted to be done by the Factory Law, which is an indispensable tool in no other part of

38 0 ... 2s. 6d. ,,
31 6 ... 8 0 ,,

to have been } 2½d. ,,
the price }
1d. per bank, } 1s. 3d. ,,

later date :—
In 1815. In 1856.
s. d. s. d.
2 8 ... 0 11
26 0 ... 8 0
1 1 ... 0 2½
1 10 ... 0 4½
1 10 ... 0 6

of cotton have commanded
almost universal, not only
for bookbinding, as a
for other purposes.
during the processes of manu-
sheets and bed covers,
from 6d. to 9d. per lb.
is used for the manufacture
being for writing paper, and
of factories supply a large
mills of Lancashire with the raw
which is used for the printing of

SUMMARY.

genius of Hargreaves, Arkwright,
aided by Watt, and carried
by the enterprising efforts of
obscure and humble pre-
been raised from insignificance
importance truly national; that
of this manufacture, our popu-
beyond any previously conceived
of our industrial pursuits have been
and, and the means of clothing have
instant and cheap.

previously undiscovered have been
of profit to their owners; agricul-
every other pursuit has shared in the
; indeed, it would be impossible to
by any detail of quantities, what
development of the national and financial
country. Mr. Porter, in his progress of the
it is to the spinning jenny and the steam
must look as having been the true mov-
our fleets and armies, and the chief sup-
long continued agricultural prosperity."

have enumerated the advantages derived
manufacture, but let us not overlook the fact
manufacture of cotton is not now confined
British dominions. It has become widely
other countries, and although we are still
supremacy, the aspect of increasing success
years to menace its long continuance here.
ago our machinery consumed two-thirds of
raised, and now it is only one-half.

following account shows the quantity of raw cot-
in the chief manufacturing countries in
1856 :—

	lbs.
Britain	920,000,000
Germany, Holland, and Belgium	256,000,000
.....	211,000,000
.....	48,000,000
States bordering on the Adriatic ...	39,000,000
United States	265,000,000
Mediterranean, &c.	56,000,000
	1795,000,000

It is not the presence of foreign competition, even of
the existing formidable extent, that would of itself be
deemed sufficient to throw a shade over the future pros-
pects of the British manufacturer. There is a sustaining
reliance in the fact, that even now it is only about three-
quarters of a century since the operation of spinning all
over the world was done by the aid of one spindle.

The position of pre-eminence we now occupy has
been attained by our energetic predecessors, who had
emerged from pastoral life, and by ourselves their suc-
cessors. It will not be attributed to those of our day,
that the originality of our intellectual power in manu-
facturing skill is being exhausted; on the contrary, there
is no lack of fertility of genius. It is, therefore, not
unreasonable to look forward hopefully to an extension
of that industry, if our political and other institutions
are so regulated that they do not fail in their duty to
commerce.

The soundness or unsoundness of our manufacturing
prosperity has become an object of study, not to say of
solicitude. That position which we now exult to look
upon, either is, or ought to be, of a permanent character,
and it would indeed be reprehensible in us if we were to
shut our eyes to any appearance of danger lying before
us. All the elements of continued prosperity are in our
possession, save one only, and that is a most material ex-
ception, namely, the command of a regular and adequate
supply of raw cotton. This constitutes the structural
weakness, the "feet of clay" of our otherwise gigantic
commercial power.

COTTON SUPPLIES.

In the early part of the present century, our supplies
of raw cotton were received from upwards of thirty dif-
ferent parts of the world—countries from most of which
we now receive none whatever; and, as a consequence,
we are now dependent upon the United States for seven-
ninth of our supply.

As a commercial question, it is a matter of indifference
to the manufacturer or the consumer in what part of the
world cotton may be grown; but in a national and
economic point of view, the question of an adequate ex-
tent of growth is one of the utmost importance. It is
desirable, if not absolutely necessary, that our supplies
should be drawn, not from one source alone, but from a
variety of sources, not only to secure greater regularity
of supply, but as a provision against the inconvenience
arising from scarcity and dearness, and possibly against
other and still more serious disasters.

The cotton of the United States is admirably suited
to all our wants. We have no indisposition to deal
with the American people. We know that it is the
desire, and not beyond the power, humanly speaking,
of the planters of America to uphold the continuance
of those supplies of which we have need, provided they
could have an adequate command of labour, but this
they have not, and, therefore, the extent of their growth
is necessarily limited to the extent of negro labour on
their plantations, as well as to the casualties attendant
upon crops of every kind. It is known also, that the
cotton-lands of the United States are limited in their
extent, ranging across that country from 33 to 34½
degrees of north latitude, and that the cultivation of
them is tending ultimately to their exhaustion.

The cotton-plant is exposed not only to the ordinary
vicissitudes of good or bad seasons, but to disasters fre-
quently arising from storms, and from the attacks of
worms and caterpillars; nor ought we to overlook the
uncertainties to be apprehended from a continued
reliance upon slave labour, or from an atmospheric
epidemic, such as the vine disease or the potato rot.
These are considerations of serious moment, as affecting
our reliance either upon America or upon any one single
country.

A failure of slight extent has an immediate effect upon
the price of cotton. An advance of one penny per pou

KNOWLEDGE AND CAPABILITIES.

... have a country to which here-
... supplies of cotton, silk, and
... Manchester Chamber of
... public-spirited individuals,
... have attracted the attention of
... of our continued reliance
... a large proportion of our
... must upon the capabili-
... of this subject they have
... legislature, the government
... the present crisis in the
... of procuring the

... the lands of India show a
... which cannot be ques-
... to be had in great plenty,
... one penny a day. The
... frosts to which the
... in the planting and
... when supplied with
... and of excellent
... cotton may be raised
... that India produced
... before a single bale had
... with all the increase
... and otherwise, how

... be equal in extent
... whilst our most urgent
... by the growth of a
... English county, that which
... years has varied from
... about 1-8th, of the con-
... This deficiency will not be
... the country, or the lethargic
... our wants. It will
... whether the policy of
... is favourable or otherwise
... can be gathered of the
... India, the effect has not been
... and capital employed in
... to the evidence sub-
... of 1848, it was stated
... the government of India to frus-
... the efforts of the English
... to improve and fertilize the
... which was read before the
... were expressly forbidden to
... Mr. Mangles, the
... stated, in ex-
... Any Europeans may
... the Company's settled pos-
... can only purchase what
... the fee sim-
... in which we in England speak of the
... what a man has not to sell.
... upon the revenue
... and ought not to part with
... or any other party."

... They have ascertained that there are a great number
of localities where cotton may be grown under favourable
circumstances in respect to soil and climate, but in almost
every country there exists agencies, local or national,
which would render it inexpedient to raise the necessary
capital for investment. The tenure of land, whilst in
most places, be found insecure, and the pursuit would be
subject to institutions which are of an unstable and
shifting character.

One instance may be related as interesting and en-
couraging. By the instrumentality of an energetic and
philanthropic individual, Mr. Thomas Clegg, of Man-
chester, there have been received from Western Africa,
during the last year, 795 bales of cotton, besides which,
there were 340 bales lost by a fire, making 1135 bales
which had been prepared for market by the chiefs and
other natives of that country, acting under the advice of
our excellent consul, Mr. Campbell, of Lagos. This
success, however encouraging in itself, will appear of
little significance in a commercial point of view, seeing,
that if this production was measured against the rate of
our consumption, it would serve us just one hour. The
fact of itself deserves our warmest appreciation, and in-
dicates the power of the free negro to minister to his
own comfort and to the world's progress. It is worth
also, of the opinion of Dr. Livingstone, that
this is the very territory for cotton."

... the lands of India show a
... which cannot be ques-
... to be had in great plenty,
... one penny a day. The
... frosts to which the
... in the planting and
... when supplied with
... and of excellent
... cotton may be raised
... that India produced
... before a single bale had
... with all the increase
... and otherwise, how

... be equal in extent
... whilst our most urgent
... by the growth of a
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... This deficiency will not be
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... in which we in England speak of the
... what a man has not to sell.
... upon the revenue
... and ought not to part with
... or any other party."

The government is virtually both sovereign and land-
owner. The improved security, so called, of tenure, is a
lease of 30 years, which they will not allow to be trans-
ferred, and the land so held is liable to seizure, and the
lease to forfeiture, at the discretion of a collector, and no
judicial appeal is allowed if a sale or transfer be attempted
without express permission.

According to the statement of Mr. Marriott, the pro-
portion of land revenue collected ranges from one-third
to one-half of the gross produce of the soil, and Mr.
Mangles makes it even more than this. From the small
amount of the salaries of the native collectors, and from
the temptations of dishonesty, it has been attributed to
them that they are not trustworthy. The Committee
inquired of Mr. Mangles, "If the natives were well paid,

do you think they would be trustworthy?" His answer was very significant, "More trustworthy, certainly. The experiment has never been tried, but it ought to be tried." Mr. Mangles also made the astounding admission, "That while the company had, during the preceding 14 years, derived a revenue from India of £300,000,000, the entire sum spent during that same period in roads, irrigation, and other public works, amounted only to the sum of £1,400,000."

Mr. Henry St. George Tucker, formerly chief financial officer under the government of India, and then, in 1846, deputy chairman of the East India Company, says, "Will industry be called into action when the demand of the tax gatherer keeps pace with the produce? Will capital accumulate where there is no security for property; no law but that which is administered under the auspices of a revenue officer? Will opulent consumers be found where no capital is allowed to accumulate? And can any country advance and become prosperous where land has no saleable value; where there is no motive for laying out capital in improvement, and where no order of human beings is to be found between the Government and the abouring peasant?" "Certainly not."

Those who have described the condition of the people of India, uniformly concur in remarking upon the onward progress of destitution. Mr. Shore says, "Throughout the country we found flourishing villages and innumerable houses, inhabited by men who lived in the style of gentlemen, keeping up their establishments of servants, horses, elephants, and equipages. These are now falling into decay, while the owners or their descendants are dwelling in mud huts, with little more than the mere necessities of life."

Mr. Tucker, in a letter to Sir Robert Grant, describes the country as "verging to the lowest ebb of pauperism; but a large portion of the public revenue has been paid out of the capital of the country, small as that capital is in itself, consisting of jewels and ornaments of the precious metals, cattle and household utensils; in addition to this lamentable evidence of poverty is another of equal force to be seen in all parts of the country, in the numerous individuals of the above class wandering about for the employment of hirelings, which they are glad to obtain even for the most scanty pittance."

Mr. Chapman says, "that the agricultural population are so totally ruined and thrown into the hands of the money-lender, that they have, roughly speaking, to begin the world afresh every ten or twelve years."

Under this extreme poverty the cultivator, ground worn betwixt the upper and the nether millstones of the tax-gatherer and the usurer, finds himself raising a crop of less than 100 lbs. of cotton to the acre, whilst the same culture under proper irrigation would have yielded him 400 lbs., and of a quality worth thrice the price per pound. The indigenous cotton grown without irrigation is dry, short, and dirty, and notwithstanding all the disadvantages under which the cultivator labours, the cost of production has been put down variously as ranging from 1½d. to 2½d. per lb.

At these prices the Indian could beat and undersell the American cultivator, but the affair of market competition does not rest upon growth alone; there is another and hitherto an insuperable difficulty and occasion of expense which has altogether deprived the cultivator in India of his advantage in first costs.

In the absence of roads, railways, canal or river navigation, his cotton has to be conveyed sometimes a sixty days' journey from the interior to the place of shipment, on the backs of bullocks, and after having been wasted in the jungles, it has, or may have, to pass through the hands of two or three sets of dealers, and when it has been adulterated with dirt, loaded with expense, and the first cost become doubled, it is then shipped to Liverpool to be sold in competition with the clean cotton of the United States.

We have already indicated the propriety and necessity

of immediate changes in India, more particularly with reference to the security of tenure to be given to the land, the provision of irrigation of improved means of conveyance, and of other essential facilities which rightfully devolve upon landlords.

How shall we approach this subject? In dealing with ordinary practical questions we are accustomed to have reference to the results of experience, and the nearest case of example will be found in the United States of America, the country with which we have been engaged in the friendly strife of cultivating cotton, and have so ingloriously been defeated.

Those who had to do with the Institutions of the United States in regard to the future wants and prosperity of their fellow citizens in that country, had before them the world's experience of conducting a government, and amongst the rest they could not fail to have reference to the policy which this country had adopted with relation to India.

Did they follow our example, or, rather, did they not shun it?

In one respect they were unable to follow it, and, therefore, the example was needless. They had not, as we had in India, a cultivated country and an abundant population, whose resources and whose industry they could exhaust.

Their starting point was upon the hunting ground of the Red Indian, whom they had to expel, and upon that they have founded the most prosperous empire in the world. They knew they had a source of wealth in the development of a fertile soil, provided they could attract labour and capital into the country by emigration.

And how did they go about the promotion of their object?

The various States struck out their territorial boundaries, framed their own laws for regulating the construction and the upholding of roads, bridges, &c., not forgetting the education of their youth, and they made large appropriations of lands to cover the expenses. They took an enlarged view in every sense. They sold the cultivator his land out and out, and did not leave him to toil upon the cotton lands pestered with tax collectors and unprovided with means of conveyance. When the proprietors of steam ships sought the navigation of their rivers, they did not set aside the application as the government of India did that of Mr. Borne, allowing him to wait nine years, till mutiny arose, before they would give him an answer; on the contrary, they acceded at once, and may now proudly boast that their mighty rivers are crowded with steamers, probably exceeding in number and in magnitude all the river steamers of Europe, conveying their productions and their merchandise in untold extent for shipment and distribution to all parts of the world.

The cost of conveyance of a bale of 400 to 500 lbs. of cotton a distance of 1,000 miles upon the Mississippi river has been as low as one dollar, and ranges from that sum to 1½ dollar, or 6s. 3d., and it is therefore in commodities and cheap conveyance, and not in the cost of growth, that the present advantage of America over India as a cotton growing country is to be accounted for.

The general prosperity of the United States may be determined by the fact, that the demand for public lands has been large and constantly increasing; that the receipts for land sales and the import dues at the custom-house have supplied the revenues of the government, without the aid of a single tax-collector; and such has been the prosperous issue of their care and forethought for the cultivator, that from one crop alone, that of cotton, the cultivators now raise a larger pecuniary amount, from year to year, than all the Government revenues of India, opium included. It may be alleged that the two cases are very different, and so they are, the disadvantage being on the side of America, in having to commence upon a country without people. It may also be supposed, that land sales in India cannot be made as in

did not pay some tax? Had not land in this always been subject to a land-tax, which, in the day, even amounted to £1,200,000? There was land in this or in any other civilised country from the payment of rates, county roads, &c.? might be obtained in India if it were made worth the owner to sell it. He would read to the some of the Government rules under which land held by those who could persuade the owner to sell it—not in fee-simple, as Mr. Ashworth had said, that was, free from taxation, a state of things and no real existence—but under the terms which he read to them:—

Throughout the greater part of India, land is already property, and cannot therefore be disposed of at the pleasure of the Government. Europeans may, however, under Act 337, "acquire and hold in perpetuity, or for any term of years, property in land, or in any emoluments issuing out of any part of British India. It is only in districts like the Deyrah Dhoon, where large tracts of waste land to which no individuals have any claim, that the Government have it in their power to make over the property to applicants desirous of cultivating it. The terms for grants in these districts were, a lease for forty years, of which one-fourth of the land was to be rent free for the first year and the remainder for three years, after which the fourth part of the rent assigned was to be paid, rising annu-ally, until at the end of the twenty-third year, the annual rent of twelve annas (1s. 6d.) per acre would be paid, and the land, subject to that payment, would be the property of the grantee. Conditions were inserted in the grant to provide for the land being brought into cultivation in accordance with stipulated annual proportions, on failure in which the whole of the grant found to be uncultivated, reverted to the Government. In the districts of Kumaon and Gurwhal, there were large tracts of land suitable for tea cultivation, which the Government proposed to dispose of. These lands will be granted to persons possessing sufficient means and capital in lots of from 2,000 acres, one-fourth to be free from assessment in the first year, and the remainder for four years, after which a rent of one anna (1d.) per acre will be charged, rising annually by one anna until in the twentieth year, when the maximum of one rupee (2s.) per acre will be reached, after which the land, though the right in the grant vests in the grantee, who, in no manner he may cultivate the land, will never be called upon to pay more than the average rate on grain crop lands in the locality. Provisions are to be inserted in the lease to the land being cultivated with tea plants, which are to be held gratuitously by Government to the extent of their

for four years no rent at all was paid, and it was only at the end of the 20th year that the maximum rent became due, one-fourth being free of rent for ever, and the rest being at from 1s. 6d. to 2s. per acre for land which was used for sugar, indigo, and oil seed worth £20 per acre; moreover, the land, subject only to that payment, was to be the absolute property of the grantee. Therefore, notwithstanding the assertion of Mr. Ashworth to the contrary, there were means of obtaining property in land in India. In the district of Kumaon and Gurwhal, there were, as was stated in the rules which he had read, large tracts of land suitable for, the cultivation of tea, and this was being carried on with satisfactory results, the raising of teas which rivalled, if they did not excel, those of China itself. In fact, the people there did not care more for that tea than was paid for such an article in this country. The conditions inserted to provide for the proper cultivation of the land could hardly be complained of. The official rules which he had quoted were now in existence, and had been made some 40 years back as the year 1837, and these rules applied to the whole of India—wherever there was waste land. About one-third of the land in India was waste. The great outcry was that India had not sent cotton for the home market—that it did not produce a regular and reliable supply of that article. Did the cotton manufacturers expect that people were to cultivate cotton in India and lay it up in store to meet the demand of the Manchester manufacturers just at the time when Ameri-

can cotton chanced to rule a farthing a pound dearer? Was that the expectation of the intelligent classes in this country? Was it rational to suppose that it could be done, and was it right to call upon any class of people to do it? Ought the government of India to interfere with any person's estate so as to compel him to cultivate any particular product in preference to any other? Had they any more right to do that in India than the Government of this country would have had to call upon the landed proprietors of England, to cultivate potatoes for the benefit of the Irish during the late famine? He contended they had no more right to interfere in the one case than in the other. Now, let them see what had been done in India, as regarded the cultivation and export of cotton in particular. The Government of India, for the last 30 years, had been engaged in prosecuting experiments with the cotton-plant. It had tried every variety of soil, and had had seeds brought from the United States, from Pernambuco, Egypt, and other parts of Africa. As much as £100,000 had been expended by the Government in these experiments, without the slightest advantage whatever to itself. It had been found that those cotton seeds except at Dharwar would not succeed in India; the indigenous plant was that which would flourish best there. Nevertheless, the stimulus applied by these cotton experiments had produced some striking results with regard to that article. The export of cotton from India to England, in the years 1834-5, amounted to 38 million lbs. In the years 1855-6, the latest date to which the customs returns were made up, the quantity exported was about 170,000,000 lbs. Thus the increase in the export of cotton from India to England in 20 years was more than 340 per cent. Did that show a want of stimulus or a lack of disposition on the part of the people of India to cultivate cotton when it was worth their while to do it; but at the same time, was it reasonable to expect that they should cultivate cotton when they could get a far larger return from the cultivation of sugar, indigo, or oil seeds? Then, again, with reference to the export of cotton from India to all parts of the world. The quantity exported in the years 1834-5 to all parts of the world was 98,000,000 lbs., and in 1855-6 it was 237,000,000 lbs., or an increase of 140 per cent. in the export of cotton to all parts of the world, whilst the exports to England alone increased in that period 340 per cent. Thus far as regarded the article of cotton. Who was fault was it if the manufacturers in England did not get the quantity of cotton that they wanted? He supposed people did not usually sit down and expect the good things they wished for to be dropped into their laps. If they wanted them they must go after them, or employ others to do so for them. Why had not the cotton manufacturers done what he had been for the last 20 years endeavouring, in print and verbally, to persuade them to do? Why had they not gone themselves to India, or sent their agents? Why did they not do as the indigo manufacturers had done? Those gentlemen went to Bengal, and either acquired landed estates, or made arrangements with the owners of such for the cultivation of indigo, which they manufactured in their own establishments in India and exported to this country. Others had done the same to obtain sugar and oil seeds. Why did they call upon government to do that which they ought to do for themselves? If they had done what he advised, they would probably have been able to obtain any quantity of cotton they required. There was a fertile soil, a fine climate, a willing people, low wages, and they had nothing to do but to make such arrangements as had been made by the indigo manufacturers. This had been done in Madras and Candia, and no doubt it was the same in other parts, almost the whole of the factories being owned by Europeans. Therefore, he contended, the fault was with the cotton manufacturers of England and not with the government of India. To go into the condition of the people of India by way of reply to the assertions contained in the paper would occupy more time than the meeting would be in-

rica, because the people are poor. The
 existed with regard to Ireland. When
 had desolated that country, and the
 Act was passed, to enable the
 land, it was supposed, to buy the
 time, little expected that capital
 Ireland, as it has since proved the
 would become purchasers of the land
 offered for sale. This may be
 in India—the opportunity to
 know that, over and over again,
 made by capitalists for people
 in the free-simple of the
 locations have been united
 there are many wealthy
 of the Indian debt has been
 many millions a-year of
 this country to India
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the assessment was 3s. 9d., but the was greater than had been stated. He said he took the value of the promony of Mr. Shaw, an intelligent pany's service, who, for many years cotton cultivation in the South and he had stated that the produce of 60 lbs. of clean cotton. There was Wight, which had just been laid and this gave precisely the same re- the produce of the land, the assess- and the cost of production from 4s. left to the cultivator as profit was 3s. per annum. He would ask whe- an assessment upon the land, any invest in it? The real fact was, that a saleable value. The next argument was that cotton was not a profitable e, and that as the land could be better productions, it was no part of the duty to dictate to the owners what crops. That was a point never contended free trade in land and production was. The other argument, which had employed in the House of Commons— none was never put forth—was, that if of Manchester wanted cotton, they and produce it. The manufacturers cotton farmers—in fact, to convert their oughs. Was not that argument upon heard? Allusion had been made to the

But they, in fact, were manufacturers. grown by the cultivator, and the blite was manufactured by the Europeans.

—That was done with cotton by the Euro- eish and Guzerat.

PEARY did not believe that, at the present as a single European cultivator of the soil He had travelled through that district ug to end. A finer cotton country could

It was covered with the remains on works, but was now a perfect jun- uite neglected. He would make, how- ecession. He did not believe British capi- immediately effectual in producing more u the soil. Cotton was not like indigo in coffee in Ceylon—the direct production of capital applied to the land. It was a produce mple agricultural labour, and ordinarily fer-

It was not therefore likely that capitalists et in land which would yield them a profit of 3s. per acre. In this country ordinary wheat he hands of a capitalist produced from 4 to of corn per acre, at 60s. per quarter. No capitalist therefore would go half round the cultivate land at a profit of 3s. per acre. It said that capital employed in irrigation would the crops. That was true. But if they applied and skill in this way, the capitalist—whether n or native—would raise more valuable products tton. They would grow oil-seeds, tobacco, and and if a Manchester house sent out agents as to grow cotton, and those agents reported that old make 30 per cent. by growing sugar, in the of 5 per cent. by growing cotton, their employers l, of course, say, "grow the more productive crop." herefore, did not believe that British capital and skill d increase the immediate production of cotton in ; but if wise and generous principles of government e applied to that country; if waste and fertile lands e sold in perpetuity, without an onerous land assess- e, which destroyed all saleable value, then he thought h capitalists would invest in it, and raise the valu- e products he had spoken of. But the same laws that d enable the European capitalist to do that, would e as an incentive also on the native capitalist,

and profits which did not attract a European would be amply sufficient for a native. The possession of land was so highly regarded in England, that a lower amount of interest was accepted than in any other kinds of invest- ment, and the love of land was just as deeply implanted in the breasts of the natives of India, who would invest in it if sold in fee simple—a thing not now known in that country, but which he hoped would shortly be introduced there. They would then see a great in- crease in the supply of cotton, grown by native capitalists and worked by native cultivators; and, under those just and equal laws which he trusted would be accorded to all our fellow subjects, of whatever colour or creed, those great and useful results which Mr. Ashworth had touched upon would be brought about, upon which the prosperity of this country and of India so mainly depended.

Dr. WATTS could not withhold his humble testimony to the extreme value of the paper read by Mr. Ashworth. The point which he wished more particularly to notice, was one which had not been touched upon by Mr. Ashworth. The great stride in the cotton manufactures took place upon the removal of the duty upon cotton. Since the removal of that duty the increase in the trade of cotton-printing had been from 500 to 600 per cent. Dr. Watts proceeded to remark that it was somewhat anomalous that, whilst the tax had been removed from cotton, yet that the refuse of that material, when made up into paper, was subject to a very heavy excise duty. It was remarkable that for some of the Continental markets it was requisite to wind the sewing-cotton upon millboard, so that whilst the cotton itself was free from duty, the material on which it was wound was taxed.

Mr. J. B. SMITH, M.P., said he had listened with some surprise to the speech of Col. Sykes, as coming from one of the governors of India, and, therefore, possessing some interest and importance. The House of Commons had recently decided that the government of the East India Company should terminate. He had given his vote in favour of bringing in this bill, and the speech he had heard that evening quite confirmed him in the conviction that he had given a sound vote on that subject. The East India Company had, for more than a century, had possession of a country which, from its earliest antiquity, had been celebrated for its riches. The riches of India were proverbial. The late Sir Charles Napier, in his own strong language, had said of India that, "What the Koh-i-noor was among diamonds, India was among nations." It possessed all the climates of the world, and a capability of yielding every kind of produce. But, notwithstanding we were possessed of this extraordinarily rich country, we exported more of our manufactures to a few thousands in Australia, than to the whole 200,000,000 of the population of India. This fact alone ought to be decisive with regard to the Government of that country. The gallant colonel had referred to the extraordinary increase in the exports, and assumed some credit to the Indian Government for that increase; but this had taken place in spite of the Government. From the very commencement the Government had endeavoured to prevent the settlement of Europeans in India, and, up to the year 1833, it was a misdemeanour for an Englishman to be found on the British territories of India. He would ask, what would have been the difference at this day if Englishmen had had the same right of proceeding to India and holding land there, that they had in our other British colonies? Instead of having only between 300 and 400 British subjects settled in the interior of India, there would probably have been 400,000 to 500,000 Englishmen settled there. Would the present state of things in India have existed if such had been the case? We had taught the Indian people nothing but the use of arms, and those they had turned against us. Colonel Sykes had told them an extraordinary story about the tenure of land in India. He (Mr. Smith) had been a member of the Committee of the House of Commons appointed to inquire into the growth of cotton in India

Mr. Sykes had quoted applied to Upper India, 700 or 800 miles from the nearest ports from which cotton could be shipped for Europe, and to a part of India from which there was a very remote probability of even getting any cotton at all; but Col. Sykes had forbore to tell them that it was the state of things in those parts from which they must look for the sole supplies of that commodity. It had been asserted that leases for a limited term could be obtained on terms favourable to those who took them. What Europeans wanted was a perpetual tenure, and he understood Col. Sykes to quote those rules as showing that they could obtain it in perpetuity. He (Mr. Theobald) said, as respected the proofs given, Col. Sykes had failed to show that it was the case. The sense in which he had applied the act of 1837 was not a correct one. What was the character of the tenure in Bombay? The servant of the Collector, at a salary of 8s. per month, ascertained the state of the crops, and the value of the land, and made an assessment from year to year accordingly; and they saw from the report of the Madras Torture Commissioners what the nature of the collection was in that presidency. There were numerous modes of torture applied in order to collect the revenues. Would it be resorted to if the payment were not of the most extortionate and oppressive character? And they saw, from the general description given, that the population was reduced to a state of extreme poverty; and, whatever gentlemen connected with the East Indian Government might say,—this could be traced to the amount that was drawn from the people in the shape of land revenue. They not only wanted cotton, but also a quality that could be used by the Manchester manufacturers. How could they hope for improvement in the cultivation with the population in the condition that had been so truthfully described by scolding speakers? There were other causes which reduced this state of things in India, foremost amongst which was the want of a just administration of the law, and of due protection to those who did enter the country; and he saw no prospect of improvement in these particulars so long as the officials of the Government were protected in their mal-practices by the Court of Directors at home.

Colonel SYKES begged to state, in reply to Mr. Theobald, that the rules he had quoted with reference to land revenue, applied equally to the whole of India, from Cape Province to the Himalaya mountains.

Mr. OTWAY would allude to the dictum of the gallant colonel, as to the general ignorance in this country upon Indian matters, if it were only to offer him the consolation that the English people were in rapid course of enlightenment on that subject. He called upon the next meeting to accept, with the least possible confidence, the statement with reference to Indian matters, as fell from a director of the East India Company, in his opinion, these gentlemen were not very accurate in their figures, and made general assertions which had frequently been proved wrong. With regard to the assessment, as far as his own knowledge went, he believed it was taken upon the value of the crops from year to year. Colonel Sykes had stated that, during the last five years, two and a-half millions had been annually expended by the Government in public works in India. This was not a fair view of the case. Mr. (Otway) ventured to say that not half a million had been expended upon really useful public works.

Colonel SYKES said this expenditure was shown by returns to the House of Commons.

Mr. OTWAY said it was true that immense sums had been expended for barracks and military works, but were not works of a character to benefit India, or calculated to develop the resources of the country. Mr. Ashworth pointed out the defects in the present Indian administration; and he (Mr. Otway) could not congratulate the gallant colonel on the advocacy of the gentleman

(Mr. Ruse) who had boasted of the conquest of the empire from Burmah to Scinde. There was much sad truth in that statement, intended as complimentary to the East India Company. It was too true that they had turned their attention to works of aggression; to building up an empire for purposes not connected with the honour and true glory of the country. They had neglected the development of its industrial resources, and that wealth which made a people truly rich and happy. Let them desist from these disastrous aggressions, and let them turn their attention, above all things, to the cultivation of cotton, and they would then confer benefits, such as the wildest dreamer never conceived, both upon India and this country.

Dr. RIDDELL wished to make a few observations, with regard to the capabilities of growing cotton in India, so as successfully to compete with the American agriculturist in the English market; for the wants of the manufacturers were such that, if from any cause at present unforeseen, the supply from America should fall, or be insufficient, a greater calamity to the nation could hardly be contemplated. He thought that it was to India we must look with the greatest confidence for meeting any deficiency, and for a continued supply of this product, whether it were from acclimatized, foreign, or indigenous seed, samples of which were lying on the table, which might be considered fair specimens of what had been grown in the Deccan without the assistance of irrigation—a point, he thought, of the utmost importance, for he felt certain that, if it was ever intended to raise this article to any extent on our Indian soil, we must not look with too much confidence to being able to bring irrigation to the aid of its increase and improvement, knowing, as he did, from the length of his sojourn in that country, that where irrigation was at hand, either from the proximity to rivers, streams, or tanks, it would be found that a more valuable product could be raised, in nine cases out of ten, than the one in question. They had been told by Col. Sykes that the American cotton could only be grown in the Dharwar districts. He (Dr. Riddell) had placed upon the table cotton grown by himself in the vicinity of Hyderabad, in the Deccan, and if those samples were placed before the best judges in Manchester, he felt confident they would be pronounced nearly as good as any that could be sent from America. If they could grow clean cotton in India like that before them, why should they go to America for it. He thought, if the resources of India were attended to, cotton like that now exhibited might be produced very extensively, and the wants of the Manchester people met. He had also placed on the table some samples of indigenous cotton, which, in Manchester, was generally declared to be 25 per cent less in value than American cotton, because it was dirty, adulterated, and unfit for immediate use. This often arose from such causes as the following: When the cotton was collected and brought to the villages, it was placed in heaps, and wood ashes were strewn in circles over it, to prevent persons stealing it without its being discovered. Other kinds of adulteration occurred, sometimes accidentally, but oftener intentionally. Besides this, he had often observed, that when the cotton was ripe for picking, the cultivator could not do so, because the assessor or collector was not forthcoming, perhaps for several days, to make his valuation. The cotton thus became loose, fell from the pods to the ground, and had to be picked up from the dirt which adhered to it, and contributed to the deterioration of the commodity for the market. It was generally picked from the bush by women and children, who took in their hands the external covering of the dry pod, which became a mass of dirt, and necessarily adhered to the wool, and was mixed with it. These were only a few of the causes from which the complaints against the indigenous cotton had arisen.

The CHAIRMAN said, at the late hour to which the proceedings had extended, he should probably best con-

[illegible][illegible]

... and Books Lecturers' Association
... 4. A letter was read by the Rev. Dr.
... in the afternoon.
... an account of the life and
... Society then actively supported
... the present should be made in
... with Windsor, and the Assoc.
... the following special
... houses, libraries and reading
... insurance and generally a great
... of the Society. The following
... the study unimpeded with
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... can be met by co-operat...

The National Books Lecturers' Association first organized its members, a body of men who were then admitted as members, annually, into classes of 25 and upward. Its funds are made up of grants to village reading-groups, book prizes, etc., and in providing circulating libraries for the use of the institutes in the Union.

...considering the vast importance
...and evening classes in Institute,
...encouragement. The following circular
...prizes for this year:—

THE FERRIS LECTURERS' ASSOCIATION, 18
— Patron: H.R.H. the Prince Consort. New
— Institutes and Reading Rooms, and to Nig
— Union with the Association.

... have the greatest number of pupils for classes, ...
(... to the number of members.)

...merit of 1.2 for the best kept register of an evening
...right school.

1. The re-ister sent in must be the one actually in use. A payment of books to the value of £1 to the pupil who has absent from his class the fewest times in a course of a year in 4 months. In case of equality the greatest growth of attendance to be taken.

Applications for these to be made not later than 15 March, 1958. A form of application will be forwarded

The Association proposes to hold a central Examination, to be open to all members of the above Institutes, Reading-rooms, or Night-schools, in the month of April, 1858, and to give the following prizes:—

1. A present of books to the value of £3 to the member of an Institute, Reading-room, or Adult Class, who shall pass the best general Examination in the following subjects:—Arithmetic, (including Vulgar and Decimal Fractions, and the Rule of Three,) Euclid to the end of Prop. 12, Book I., Geography of the British Isles, History, (the leading facts and dates of the reign of George III.), Writing from Dictation, English Grammar, and Composition.

2. A present of books to the value of £1 to the next best.

3. A prize of £1 for the best Original Architectural Drawing done in a class, accompanied by a certificate from the teacher, of his belief that the design is original.

4. A present of books to the value of £1 for the best abstract or account of a Lecture, or course of Lectures, delivered during the season of 1857-58 in the Institute or Reading-room.

5. A present of books to the value of £1 for the best Original Essay on "The opportunities given to all classes in England for rising to eminence, illustrated by examples."

N.B.—For 3, 4, and 5, the papers sent in must be marked only with the initials of the candidate, but must be accompanied by an envelope containing on the outside the initials, in the inside the name and address of the candidates. The envelopes with the names of the unsuccessful candidates will be destroyed unopened.

6. A present of books to the value of £1 to the scholar of a night school whose writing shall show the greatest improvement during the winter.

The improvement to be judged of by copy-books selected by the manager of the school. There must not be more than one candidate from each class.

7. A present of books to the value of £1 to the scholar of a night school who shall pass the best examination in arithmetic—(first four rules, simple and compound reduction, rule of three, and vulgar fractions.)

8. A present of books to the value of £1 to the best reader among scholars of night schools.

Not more than one to be selected from each class.

N.B. All drawings, papers, and names of the candidates must be sent in to the secretary on or before the 31st of March, 1858, accompanied by a testimonial, signed by the secretary or manager of the institute or school, of general good conduct. The list of examiners and adjudicators will be forwarded hereafter with the date of examination.

E. HALE, Hon. Sec.

Institutes are admitted into Union with the Bucks and Berks Association on the payment of two guineas annually; this entitles them to six lectures.

Village reading-rooms, schools, and class-rooms, are taken into Union on the application of a member of the Association. Some 80 institutes, reading-rooms, and schools are now in Union with the Association. By still further extending its operations, and by the appointment of Local Secretaries, who will make known local wants and peculiarities, the Association trusts to carry out still more adequately than at present its original objects.

The Association is in Union with the Society of Arts, and hopes, through the Society's plan of Local Boards of Examiners, to find great aid in its educational work.

The Association is under the patronage of H.R.H. the Prince Consort, who has most warmly encouraged it, having presented it with £50 worth of books, and placed the reading-rooms and evening classes of his farm labourers in union with it.

The Association is also deeply indebted for valuable advice to the Hon. and Rev. S. Best, of the Hants and Wilts Education Society, and to James Hole, Esq., of the Yorkshire Union of Mechanics' Institutes.

The management of the Association is vested in a Committee. The Hon. Secretaries are the Rev. E. Hale, Eton College, and the Rev. T. H. Tooke, Upton-park, Slough.

HERBERT'S FLOATING BEACONS.

The following has been received from the editors of the *Mechanics' Magazine*:—

GENTLEMEN,—I find in the *Journal of the Society of Arts*, of March 5, the report of a paper read before the Society by Mr. Findlay, on English Lighthouses. Speaking of floating beacons, he says that a Mr. George Herbert has answered the conditions required for a floating light, which are, that it should keep upright, and be free from any violent oscillation. This is done, he goes on to say, by mooring the beacons, "which are of a circular plan, from their centre of gravity, which is so arranged as to be nearly or quite on the line of floatation." "Such buoys were brought into use by the Trinity Board in 1854, and perfectly fulfilled the condition proposed."

On turning to the *Mechanics' Magazine* for Nov. 24, 1855, (No. 1855), I find an account of a paper read by Mr. Herbert, on the construction of buoys, beacons, &c., in which he says that, with a view of obtaining a stationary floating body, which should have a tendency to ride easily, and to retain its perpendicularity, "a wrought-iron pear-shaped buoy was constructed, of a circular form in plan, and terminating above in an apex, so distributing the weight as that the centre of gravity should be situated a little below the centre of the plane of floatation, and the bottom was made concave and raised up internally, so as to form a cone, to the internal apex of which the mooring chain was attached."

The article goes on to say that "this quality of retaining its vertical position arose from the force of the tide or wave being simultaneously exerted upon one side of the exterior of the buoy, and on the opposite side of the interior cone; the forces so nearly balancing each other as to retain the floating body in an almost perpendicular position." Now, Sir, I do not doubt that buoys constructed in this way would float nearly upright, but I cannot believe that they would do so for the reason assigned above; nor can I think it necessary that the chain should be attached at the centre of gravity. The simple reason why they would retain their perpendicularity I conceive to be that the resultant force of the water against their sides, caused by a tideway or other current, would act through the point of attachment of the chain, not because the buoy was of a circular form in plan, but because it was *accidentally* a spherical surface below the water, as shown by the drawings, and the chain was attached at the centre of that sphere. And, so far as the *equilibrium* was concerned, the centre of gravity may have been anywhere in the vertical. For the sake of *stability*, however, it should be *below* the point of attachment, if possible. You seem to have pointed out the secret of success in this matter in your number for September 12, 1857,* containing an engraving.

* AN IMPROVED FLOATING BUOY OR BEACON.

At page 485 of our 63rd volume, we published a description of an iron floating buoy or beacon, designed so as to ride easily, and remain perpendicular, or nearly so, in rough water. The essential feature of the improved buoy consisted of a conical hole in the centre, into which the chain used for mooring it rose, being made fast near the centre of gravity of the vessel. M. Trajano de Carvalho, a gentleman belonging to the Naval Architectural Department of the Imperial Brazilian Navy, having heard that this buoy was found in practice somewhat defective, has designed an improved buoy, with the same objects as in the former case, and has favoured us with a sketch of the same. M. Carvalho's buoy is represented in section in the annexed engraving.* It is spherical in form at the lower part, and it will be seen that the aperture in the bottom is dispensed with, the mooring chains being attached to a link at the bottom of a pair of rods, the upper extremities of which turn on pins or bolts. These pins or bolts are fitted at the height of the centre of the sphere of which the bottom of the vessel forms a part, and pass (for the sake of strength) into a cross beam, which, at the same

* The mast or pole of the beacon is considerably shortened in the engraving, to save our space.

ing of a buoy invented by M. Carvalho, which you describe as being spherical in form at the lower part, the mooring chains being attached to a link fitted at the height of the centre of the sphere, and the ballast so disposed as to cause the centre of gravity to fall below the centre of form. The buoy invented by this gentleman would not be liable to injury from the rab of the mooring chain, as Mr. Herbert's always must be.

Trusting that you will use your scientific influence to have proper persons appointed to conduct any experiment which may be made with reference to this very important matter, so that a good idea may not be lost through its having fallen into feeble hands,

I am, Gentlemen, your obedient servant,

N. B.

March 6, 1858.

[The above letter of our correspondent, relating to the paper which appears on a former page of this number, directs attention to a very important point, and we feel it our duty to respond to the appeal made in its last paragraph. If official experiments are to be made with the improved beacons and lights, let there be no misconception as to the true principle of their construction. It appears to us unquestionable that our correspondent is right, and that Messrs. Findlay and Herbert are wrong. No scientific reason whatever can be assigned for the proposition which they put forward, viz., that a vessel, circular in plan, and moored at or near its centre of gravity, shall maintain perpendicularity in a stream or tideway; and Mr. Herbert's notion, that the action of the current upon the interior of the cone would tend to this result, is manifestly mistaken; for the very circumstance of the buoy being upright will effectually prevent any such action taking place. At the meeting of the Society of Arts, Mr. Findlay mentioned the fact

time, forms a step for the mast or pole. The beacon is formed of a series of hoops or half hoops, which may be painted red, to enable them to be better seen at a distance. The improved buoy is ballasted so that its centre of gravity falls below its centre of form, and if situated in a current, would swing across the tide,



and itself float upright, while the rods were inclined at an angle more or less great to the surface of the tide. Such a buoy would

that an experimental beacon, made on Mr. Herbert's principle, had been found, in rough weather, to swing through an angle of 10 deg.—about two-fifths of the angle described by an ordinary beacon. Nothing is more likely than that this amount of oscillation was a gross measure from neglect of the true principle to be served, which, as "N. B." remarks, was indicated in our description of Mr. Carvalho's beacon, in September last. That principle is, that the moorings of the buoy should be attached to it at the height of the point at which the resultant pressure of the stream intersects the vertical axis of the beacon. (Here we, of course, suppose friction.) It is this condition which M. Carvalho has in his beacon. With regard to the entire submergence of buoys by the action of strong currents, as mentioned by Mr. Findlay, we may remark, that the only remedy the evil is to increase the displacement of the buoys. We offer no apology for these comments, as we believe the success of the proposals which Messrs. Findlay and Herbert have so much at heart, depends upon the facts to which we here direct attention.—*Mechanics' Magazine.*

SOUTH KENSINGTON MUSEUM.

During the week ending 6th March, 1858, the following have been as follows:—On Monday, Tuesday, Wednesday, free days, 2,044; on Monday and Tuesday evenings, 2,105. On the three Students' days (open to the public 6d.), 472; one Students' evening, Wednesday, 48. Total 4,669.

Home Correspondence.

LIGHTHOUSES.

SIR,—In the discussion on Mr. Findlay's paper on Lighthouses, on Wednesday evening last, you have in some way misunderstood me, and consequently has not reported my remarks quite correctly. I make me say, "That I had the testimony of Mr. Brooking, one of the Newfoundland Light Commissioners, that a face of three of these deep red beacons was capable of being seen, in all states of the atmosphere, at a distance of over thirty miles, and of no other description of reflector of which the same number of faces, the same results could be reported. What I really did say, was, "That I had the testimony of Mr. Brooking, one of the Newfoundland Light Commissioners, that a light, with three of these reflectors on a face, could be seen over thirty miles in an ordinary state of the atmosphere, and I did not think the same could be said of the Huddart reflector, with the same number on a face."

I am, Sir, your very obedient servant.

WM. MATTHEW.

267, Strand, London, March 6, 1858.

NEW ZEALAND AND ITS RESOURCES.

SIR,—In the discussion which ensued on Mr. Findlay's paper on New Zealand, my friend Mr. Sidney Herbert questioned my statement of its grazing capabilities, remarking:—"He would also warn intending emigrants against the idea that, whereas, without cultivation, could feed three sheep per acre, with cultivation could feed six sheep per acre. Those were statistics he apprehended, taken from New Zealand heads. The fact was, that the land best adapted for sheep feeding was just that which was not fit for cultivation &c."

as received from my brother, who writes to me from Plymouth, as follows:—

"I have read the paper of Mr. Stones, and your remarks, &c., and think them very good, and certainly biased. With respect to the wool, I have heard at times that the New Zealand wool is very much superior to the Australian, from the fact that the wool never stops growing, as sometimes occurs in New South Wales and other parts of Australia; therefore, the fibre of uniform thickness throughout, and fetches a higher price in the market. I know one place, Pakaraka—Chescon Williams's place,—near the Bay of Islands, where eight sheep are fed all the year round on one acre pasture land, sown with English grasses. I have seen and know this myself. I intend sending a copy of my Journal to my friends at Auckland, and the paper will appear in the local journals."

This statement will, I think, bear out the opinions I record.

I am, &c.,

PETER L. SIMMONDS.

(Windsor street, Pimlico, March 4, 1858.)

STEEL-BORED ORDNANCE.

SIR.—Absence from home prevented my seeing Mr. W. Reveley's remarks in the *Journal* of the 5th Feb. per. I am sorry to say I can see nothing in that gentleman's letter to induce me to alter the opinions expressed by me on the 29th Jan.

With your permission I will examine more closely into the merits of Mr. Reveley's plan. I stated that "the boring of such a mass of steel was open to serious objections." Mr. Reveley corrects me on this head, and in part of his theory, instances the welding of ordinary barrels. The ordinary barrels are not welded from a coil, but from a flat iron bar, called a "scelp," 13 lb. long, six inches wide, by half-inch thick; this scelp is passed through elliptical rolls, and drawn taper, through a series of grooved rolls and brought into cylindrical state, and afterwards welded on a cold mandril by passing through elliptical grooved rollers; the barrels thus treated are passed through the rolls fourteen times, and are heated each time; the barrels of all the service rifles are made in this way; sporting gun barrels the better class of barrels are made from a spiral coil, a which is, as Mr. Reveley justly remarks, extremely strong, and they are welded at one heat by "jumping;" the barrel made in the way described weighs, in the rough, 18 or 20 lbs., and measures 30 or 40 inches in length. In some cases may be, these being the standard lengths of field rifle barrel. These barrels are all made of solid iron or iron and spring steel; a barrel of cast-iron is a rare exception in this country, but common in America, where they are bored out of the solid bar.

In the spiral bore Mr. Reveley proposes to employ in the manufacture of his large ordnance will weigh upwards of tons, measuring 12 feet in length, by 18 inches diameter in the finished coil. To form this spiral, a barrel would be required 162 feet long by four inches square; we will conceive this mass of steel in a coil, for the welding operation. A furnace is required to heat it in at least 14 feet long, and it must be borne in mind that it is not the surface only that must be brought to a welding heat, but the edges of the coil, and this, too, uniformly throughout; a little too much heat in any part damages the whole; if underheated, no weld will place. If it is proposed to weld it piecemeal, a mass of the previous welded part must be brought up to time to a white heat. The "jumping" of four or five coils of steel will not be such an easy or simple matter as jumping a gun barrel weighing 10 lbs.; some machinery must be employed to lift it, and the probability is by the time it is ready for the "jump," the metal will be too cold to adhere. I think I need not say so Mr. Reveley that the surface will be in a bad state long before the sides.

Next come to the crystallisation of the surface.

Mr. Reveley says, "large quantities of chilled cast-iron are used for a variety of purposes, and I never yet saw the iron mould affected by the melted metal." This statement is beyond question, but I cannot see any ground of comparison between chilled cast-iron and the question at issue. By pouring cast-iron into a metal mould, the temperature of the iron in immediate contact with the mould is instantly lowered, but not so with the internal iron; the "chilling" does not penetrate beyond an inch or an inch and a half, and for some time the metal internally remains in a fluid state. I presume Mr. Reveley would cast the "jacket" round the bore in sand, and heat the bore before placing it in the moulding box, to prevent "chilling," which would be destructive to the "jacket;" if not heated, two errors will be fallen into—first, the metal will be chilled and its brittleness increased, and secondly, it will rend in various places, for, while the cast-iron is contracting the steel is expanding. Whatever the treatment may be, the result will be the crystallisation of the outer surface of the coil; to prove this, Mr. Reveley has only to take a bar of such steel as he proposes to employ for his coil, and then plunge it into a ladle of molten cast-iron, and then test the result. Of course it must be left in the ladle till the iron is set.

In treating of the shrinkage I cannot admit that the core "is at a low degree of heat;" it must be brought up to the same temperature as the surrounding fluid, and the particles of steel on the outer surface of the coil will be expanded to their utmost limit, thus bringing it again into the same—if not a worse—state than unhammered cast-steel. Both cool together, the steel contracting in a greater ratio than the iron—but whether so great as to be seriously detrimental to the supposed ordnance, actual test alone can decide.

We now come to my own experimental cannon. I am sorry I did not express myself so clearly on the method of construction as to prevent any wrong impression being entertained by Mr. Reveley. The bore was cast hollow, four inches square, and was hammered, or, if Mr. Reveley prefers the term, drawn, down on a mandril to 2½ inches diameter, cold-hammering being carefully avoided; this gave it its full cohesive strength.

I am, &c.,

W. HAWKSWORTH.

Aven Steel and Iron Works, near Llanthegwy, Feb. 15, 1858.

STEAM PLOUGHING.

SIR.—Allow me to inform Mr. Homersham that the Stirlingshire Agricultural Society's judges are in error, for I have ploughed the whole of fields without shifting. As an instance of what I am prepared to do, and publicly, if required, I will take a field on my own farm (it contains 18 acres, with one straight and three not straight fences), I will set the engine, windlass and tackle down, and plough the whole of it, including the headlands, without shifting the engine and windlass, leaving less in the four corners than is usually left when ploughing is done with horses.

I am, &c.,

W. SMITH.

Woolston, Feb. 22, 1858.

MEETINGS FOR THE ENSUING WEEK.

- Mon. Royal Inst., 3. Prof. Huxley, "On Biology." Statistical, 3. Anniversary.
- United Service Inst., 8½. I. Mr. H. D. Cunningham, "On the History of Sails and Sail Power, and on Cunningham's Improvements in Reeling Sails." II. Mr. G. Biddlecombe, R.N., "On Steam Navy Tactics."
- Tues. Royal Inst., 3. Prof. Huxley, "On Biology." Civil Engineers, 8. Renewal Discussion, "On Submerging and Repairing Submarine Telegraphic Cables." Statistical, 8. Mr. W. A. Wilkinson, "On Railway Terminal Accommodation, and its effects on Traffic." Pathological, 8.

- WED. United Service Inst., 3. Capt. Fishbourne, "On the *Lewis* Steam Ship."
 London Inst., 7.
 Society of Arts, 8. Mons. F. R. de la Tréhouais, "On the Past and Present of French Agriculture."
 Microscopical, 8.
 THURS. Royal Inst., 3. Prof. Tyndall, "On Heat."
 Philosophical Club, 5.
 Antiquaries, 8.
 Chemical, 8. Messrs. Perkin and Duppe, "On the Action of Bromine upon Acetic Acid."
 Linnean, 8.
 Philological, 8.
 Royal, 8.
 FRI. United Service Inst., 3. Mons. Soyer, "Military Dietetics, or improved System of Cooking for Army and Navy."
 Royal Inst., 5. Mr. Henry Thomas Buckle, "On the Influence of Women on the Progress of Knowledge."
 SAT. Asiatic, 2.
 Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the Elements which circulate in Nature."
 Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, March 5, 1858.]

- Dated 10th February, 1858.*
 247. G. Richardson, 2, Copenhagen-street, Islington, and W. Richardson, 5, Ranelagh-grove, Pimlico—The construction of three-wheeled carriages, and omnibuses so constructed, as to be called first-class omnibuses.
Dated 15th February, 1858.
 234. P. Mollinari, Marseilles, France—An improved composition, to be used externally, for preventing sea sickness and illness arising from similar causes.
Dated 18th February, 1858.
 307. E. Cuvelier, Arras, France—Improvements in steam engines.
 309. W. E. Newton, 66, Chancery-lane—An improved optical instrument, which the inventor denominates a "Tropescope." (A com.)
 311. J. H. Johnson, 47, Lincoln's-inn fields—Improvements in machinery or apparatus for making bolts and rivets. (A com.)
 313. H. Blair, Kearsley, Lancashire—Certain improvements in the method of recovering the sulphur which has been used in the manufacture of soda ash, and in the apparatus connected therewith.
Dated 19th February, 1857.
 316. J. Beattil, Lawn-place, South Lambeth—Improvements in locomotive and other steam engines, parts of which improvements are respectively applicable to other purposes.
 317. J. Syers, Liverpool—Improvements in the decomposition of salt, and in the abstracting of metals from their ores.
 319. E. Griffiths, 69, Mornington-road, Regent's-park—Improvements in screw propellers, and apparatus for governing engines used to give motion to screw propellers.
 321. T. Brasenor senr., and G. Brasenor, Junr., Birmingham—Certain improvements in mill bands.
 323. J. E. Cook, Greenock—Improvements in binnales or apparatus for holding marine compasses.
 325. W. Clark, 53, Chancery-lane—Improvements in filtering water, and in apparatus for the same. (A com.)
Dated 20th February, 1858.
 327. R. Little, Glasgow—Improvements in machinery or apparatus for washing and mangling.
 329. W. Thomson, Glasgow—Improvements in testing and working electric telegraphs.
 331. G. Gentile, 41A, Queen-street, Cheapside—Improvements in ornamenting lace, netted, knitted, and woven fabrics.
 333. F. M. Baudouin, Paris—Improvements in electric telegraph cables.
 325. H. Rey Rimels, Brussels—A new process of manufacturing potato meal or f-cula.
 337. W. Clark, 53, Chancery-lane—An improved rotary engine. (A com.)
 339. G. Catlin, Brussels—Improvements in the construction and propelling of steamers.
Dated 22nd February, 1858.
 341. G. Schaub, Birmingham—A new or improved manufacture of certain kinds of printing type and other printing surfaces.

343. W. Cory, Jan., Gordon place, Grafton-square—An improvement in the manufacture of artificial fuel.
 345. R. A. Brooman, 166, Fleet-street—An improvement in the use of precious metals. (A com.)
 347. J. Potts, 24, Park-street, Southwark—Improvements in the machinery for cutting and shaping toothed gearing.
Dated 23rd February, 1858.
 349. R. Telford and M. Hope, Birmingham—Improvements in tools for furniture.
 351. W. McLennan, Glasgow—Improvements in the manufacture of boots, shoes, and other coverings for the feet.
 353. E. Shepard, Jernyn-street, St. James—An improvement in improvements in depositing metals and metallic alloys by electricity.
 355. G. F. White, Mark-lane—Improvements in doors and shutters.
 357. W. E. Newton, 66, Chancery-lane—An improved process of producing photographic pictures or designs on the surface of stone or metals, so that impressions may be taken thereby by the process of lithographic printing. (A com.)
Dated 24th February, 1858.
 359. B. Smith, Hyson Green Works, near Nottingham—Improvements in apparatus for insuring the correct action of safety valves of steam boilers.
 361. A. Hector, St. Cyrus, Kincardine, N.B.—Improvements in apparatus for taking or catching fish.
 363. C. Girardet, Vienna—A new moveable shaft bore, or supporter of coaches.
 365. J. Petrie, Rochdale—Improvements in apparatus for regulating the flow of steam.
 367. W. E. Newton, 66, Chancery-lane—The application to several other vehicles of apparatus for weighing the load contained in such vehicles. (A com.)
 369. H. Browning, Avon cottages, Clifton road, Bristol—An improved composition for covering iron and other ship bottoms and other surfaces.
 371. R. F. Miller, Hammer-smith—Improvements in candles.

INVENTIONS WITH COMPLETE SPECIFICATION FILED.

370. W. K. Foster, State of Maine, U.S.—An improvement in the manufacture of blades for pencil sharpeners or other articles of like nature.—34th February, 1858.
 386. A. J. Desales, 13, Rue des Enfants Rouges, Paris—Improvements in oil lamps for railway carriages, ships, and other purposes.—27th February, 1858.

WEEKLY LIST OF PATENTS SEALED.

- March 5th.*
 2336. U. Scott.
 2341. B. Sharpe.
 2351. J. Eastwood and S. Lloyd.
 2361. J. D. Dunciciff.
 2363. W. Crofts.
 2389. J. Walsley and T. Howard.
 2409. E. Hayes.
 2428. G. E. Dering.
 2431. J. W. Burton and G. Pye.
 2435. M. R. Leverton.
 2439. W. H. Feake.
 2484. M. Henry.
 2487. G. Speight.
 2513. E. Thompson and W. J. Nicholson.
 2603. H. Edwards.
 2633. Capt. G. Rhodes.
 2631. A. René le Mire de Normandy.
 2999. G. T. Bonfield.
 3067. J. M. Prasad.
 3167. J. B. Howell and J. M. ridge.
 3137. A. René le Mire de Normandy.
 3173. J. Wand-worth.
 37. T. Greenwood and J. ley.
March 6th.
 2350. E. Lavender.
 2353. H. Lawford.
 2357. W. Jamieson.
 2358. J. Fenton, W. Thoms, and T. Seward.
 2364. G. Birmingham.
 2367. J. Mills.
 2370. S. Colbeck and W. E. Colbeck.
 2386. A. Gray.
 2442. J. Minnitt.
 3185. F. O. Ward.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

- March 1st.*
 478. R. Boby and T. C. Bridgman.
 488. A. L. Garnier.
March 2nd.
 466. W. G. H. Taunton.
 481. C. Illes.
 489. J. Lewis.
 501. W. Lister.
March 3rd.
 496. A. Hotchkiss.
 502. H. D. Poole.
March 6th.
 504. J. Cooper.
 506. William Walsh.
 523. J. Noron.
March 6th.
 525. J. Bernard.
 529. J. Bullough.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4664	March 4.	Self-acting Valve Ventilator	R. Bamage	554, Holywell-st., Milbank, Westminster.
4665	" 9.	Improved Gas or Air pressure Gauge	W. Reichenbach	33 & 34, Borough-road, Southwark.
	" 16.	Metal for Forks, Spoons, and Ladles	R. F. Sturges	Birmingham.

Society of Arts.

MARCH 19, 1858.

NOTICE.

For two Conversations; the first on the Society's House, and the second to each member; on the 8th May, at the Society's House, the card for which is sent to your friends, ladies or

GRANT FUND FOR 1858.

A letter has been addressed to the Secretary of the Society:—

The Secretary of Arts, Manufactures, and Commerce, London, W.C., Jan. 30, 1858.

The Council to inform you that the Grant Fund for 1858 is now opened. The sum contributed by twenty-two members is a small balance to carry

attention to the fact, that last year's grant was reduced to two centres. At these two centres, thirty-seven Institutions only presented themselves from the metropolitan area being one centre; sixteen from the second centre, leaving England, Ireland, Scotland, and Wales.

One of the reasons which led to the system was not adapted to the Institutions. They, therefore, decided on contributing a certain sum towards the travelling expenses of those candidates to receive personally and publicly their prizes.

The Society's certificate in the subjects contained in the Oxford Examinations. These changes will be required for the prizes, and I am instructed to draw the attention of all the candidates to the circumstances.

It can be remitted to Mr. Samuel Thomas, Financial Officer, Society of Arts, Adelphi, to whom Post-office Orders should be made

I am, Sir, your obedient servant,
P. LE NEVE FOSTER, Secretary.

The following is the list of Donations up to the 1st of March:—

Member of Council.....	£ 5 5
Auditor	5 5
.....	10 10
.....	5 0
.....	5 5
.....	10 10
.....	1 0

H. D. Cunningham, R.N.	£1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation).....	10 10
F. Seymour Haden (annual)	2 2
William Haworth	1 1
Edward Highton (annual)	2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Council (second donation).....	10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford.....	1 1
Charles Ratcliff, Hon. Local Sec. (annual)...	10 10
William Tooke, F.R.S., Vice-Pres.....	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council (third donation).....	10 10

EXAMINATIONS.—LOCAL BOARDS.

The following circular has been issued by the Local Board at Leeds in connection with the Yorkshire Union:—

THE LEEDS LOCAL EXAMINATIONS COMMITTEE AND BOARD OF EXAMINERS, IN AID OF THE SOCIETY OF ARTS EXAMINATION SCHEME.

Leeds, 22, East Parade, March 1858.

TO THE PRESIDENT AND COMMITTEE OF THE * * *

GENTLEMEN,—Your immediate attention is respectfully solicited to the following statement:—

In accordance with the general plan of the Council of the Society of Arts for the present year, a Committee and Board of Examiners have been formed for this locality, to assist in carrying out the Examination scheme of the Society. The operations of this Committee and Board will extend to all Institutions in and around Leeds who may wish to avail themselves of their aid, and, indeed, to any others in Yorkshire that may desire to send Candidates to Leeds for Examination.

According to the "Examination Programme" of the Society, it will be required of Candidates that they undergo a "Previous Examination."

- 1st. To test their Handwriting and Spelling.
- 2nd. To test their knowledge of English Grammar and Composition.
- 3rd. To test their knowledge of the Elementary Rules of Arithmetic, including the Rule of Three.
- 4th. To test their knowledge of the *Special Subjects* in which they desire to be examined by the Society's Board of Examiners.

Candidates who satisfy the Local Examiners at the "Previous Examination" as to their acquaintance with the simple and elementary branches of study referred to, and also as to their knowledge of the *Special Subjects* upon which they desire to be examined, are regarded as "Passed Candidates," and are therefore eligible to undergo the "Final Examination," which will be conducted under the supervision of the same Local Board, but by means of written papers sent from the Society of Arts.

The previous Examinations will take place at Leeds, on Tuesday, April 6th, and Wednesday, April 7th, beginning each day at 10 a.m.

Persons who purpose to come forward as Candidates, will please to signify their intentions to the Committee, if possible, on or before Saturday, March 27th, and, at the very latest, on Wednesday, March 31st.

The Report of the Board of Examiners on the "Previous Examinations" will be laid before the Local Committee on Friday, April 9th, immediately after which the Candidates will severally be informed of the decision of the Committee on their eligibility. The precise date of the "Final Examination" will at the same time be communicated to each Candidate.

The following is the list of Local Examiners, with the Department assigned to each:—

Reading, Writing, Arithmetic, English Grammar, and Composition..	Mr. H. E. Kincaid, M.A., Head Master of the Leeds Mechanics' Institution and Literary Society's Schools. Mr. A. Oliver, Principal of Woodhouse Academy.
Geography, English Literature, and History.....	Mr. A. Oliver.
Mathematics and Book-keeping.....	Rev. Henry E. Phillips, B.A., Incumbent of Christ Church. Mr. H. E. Kincaid, M.A.
Chemistry	Mr. Thos. Scattergood, Surgeon, and Lecturer on Chemistry at the Leeds School of Medicine.
Botany	J. D. Heaton, Esq., M.D. Lond., late Lecturer on Botany at the Leeds School of Medicine.
Physics	Mr. Alexander M'Ivor, Certified by the Government Department of Science and Art as a Teacher of Physical Science.
Physiology	Mr. Claude Wheelhouse, Surgeon, and Lecturer on Anatomy and Physiology at the Leeds School of Medicine.
Political and Social Economy.....	Mr. James Hole, Hon. Sec. Yorkshire Union of Mechanics' Institutes.
Classics and Roman History	Rev. C. E. Moberly, M.A., Second Master, Leeds Free Grammar School.
French	Mons. Brocard, Teacher of French Language and Literature.
German	Herr Reunert, Teacher of German Language and Literature.
Drawing	Mr. John White, Head Master, Leeds School of Art. Mr. Charles Ryan, Assistant Master, Leeds School of Art.

N.B. No Candidate will be examined in more than three special subjects.

EDWD. BAINES, Chairman *pro tem*.
ALEX. M'IVOR, Secretary.

FIFTEENTH ORDINARY MEETING.

WEDNESDAY, MARCH 17, 1858.

The Fifteenth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wed-

nesday, the 17th inst., Sir Thomas Phillips, Member of the Council, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Fenn, Joseph	Hedley, Thos. Abercrombie
Healey, Elkanah	Boney, Sir Cusack
Sheppard, T. B. W.	

The Paper read was:—

ON THE PAST AND PRESENT OF FRENCH AGRICULTURE.

By F. R. DE LA TREHONNAIS.

The proud position which English agriculture has taken amidst the arts which, by their excellence, characterise the civilisation of our age, has necessarily drawn upon its progress and development for the last fifty years the attention of the whole world. Improved means of communication have induced foreigners to come and visit English farmsteads and agricultural exhibitions, whilst international shows have enabled still greater numbers to gaze upon the wonders of English industry, by placing in conspicuous evidence the excellence of England's breeds of cattle, and the singularly effective ingenuity of her agricultural implements. There is in progress this providential economy, that its diffusion obeys similar laws to those which regulate the transmission of light, sound, and heat. Like these natural phenomena, progress will radiate, expand from the centre of its existence, and diffuse itself all around, in spite of routine and opposition, until a perfect equilibrium is established. Hence the eagerness manifested by other communities, some immediate neighbours to this island, some dwelling at its very antipodes, to come and copy English systems of practical husbandry, study English experience in every branch of agricultural economy, and obtain English cattle, implements and seeds, that they may in their turn, with all the advantages of more favourable climates, reap the benefits of improved practice based upon sound theory.

This intercourse in the case of France, whose agriculture is the subject of my paper, fostered by the close proximity of our respective shores, rendered more intimate by the links of a political, and, I trust, national and popular alliance, and made still more practicable by means of the international shows which have lately taken place—this intercourse, I say, has naturally excited among Englishmen a greater interest in the agricultural status of France than in that of any other nation.

A few years ago a gifted French economist, M. Leonce de Lavergne, wrote a book on the agricultural economy of Great Britain, in which, in order to bring out the facts upon which he based his arguments in a more conspicuous manner, he compared statistical and economical statements about the condition of England and France, and it must be admitted that the inferiority of the latter, in every branch of her agricultural economy, was most forcibly established. My object this evening is not exactly to impugn that position, but rather to explain and qualify it, and then to show that, after all, there are, in the past, and especially in the present state of French agriculture, many causes of pride and honour, which give it a place, not unworthy the greatness which France has gained in other arts and achievements, and which, I hope, continuing to develop themselves with that steadiness and persevering energy which are the true characteristics of progress, will, ultimately, not in antagonism, but in noble rivalry with English excellence and perfection, reach at length that desirable degree of efficiency and productiveness which is the surest and safest element of national independence and prosperity.

French agriculture has not always stood in so great an inferiority to that of England, for there

was a time when it was so flourishing that the supply of grain to England was mainly dependent upon French harvests. History tells us that up to the 16th century, England and Scotland were so far behind in industrial and agricultural pursuits, that Francis I. had to send over to this country two artisans of each trade, and several sets of agricultural implements. Even in the time of Queen Elizabeth, England was almost exclusively dependant upon Belgium and Flanders for her supply of vegetables, and it was from these provinces that she obtained her first notions of improved husbandry.

A glance at the history of England up to that period is sufficient to account for this comparative inferiority. War, especially civil war, and agriculture have two widely different objects; the one is production, the other destruction; and it is obvious enough that, as long as intestine war was waged over this country, a state of barbarism in arts, as well as in manners, must have been the lamentable and inevitable result.

To the same cause, in a great measure, and to others, to which I shall presently allude, must be ascribed the great neglect into which French agriculture was suffered to lapse, from the commencement of the seventeenth century up to within the last few years, when unmistakable symptoms of revival have manifested themselves, with a degree of energy and earnestness which bids fair for a speedy regeneration.

In order to measure, as it were, the extent of the decline of French agriculture, and to form a correct estimate of the progress that has been lately made, I will describe, in the first place, what was the status of agricultural practice in the sixteenth century, and compare it with that of modern times. I conceive that by so doing I shall best succeed in giving a clear and comprehensive idea of the history of agriculture in France for the last three hundred years.

I have selected the sixteenth century as a starting point for our inquiries, not only because that time was, in my opinion, the most prosperous and flourishing period of the history of French agriculture, but because this is the earliest date when there is any record of agricultural science and practice to be found in the annals of French political economy. I allude especially to the remarkable work of Oliver de Serres, entitled "The Theatre of Agriculture," which gives, in a full and clear exposition, a complete account of agricultural practices and notions in his time.

The perusal of this curious work, which is very little known, although often spoken of, fills one with astonishment, not to say humiliation for our present boastful age.

It is the fashion now-a-days to expound alleged new ideas and theories, to point to practices, the efficacy of which is everywhere recognised and admired, as the discoveries of our times. Subjects are daily discussed, conclusions are drawn in public meetings and newspaper leaders, as if they had burst for the first time upon public attention. We frequently have to listen to learned disquisitions upon the rotation of crops; the so-called theory, and, still more so, the practice of drainage; the various modes and means of preparing the land; the selection of seeds; the necessity or, at all events, the usefulness of meteorological observations; the equalisation of weights and measures; the duties of employers towards their labourers; the principles of leases; the economy of the management of landed property, &c. We are wont to engross our minds with the consideration of all these topics, and those who undertake to lecture us upon them seem to handle those subjects as if they were presented for the first time to the attention of mankind, as if they were new questions only just arising from the force of the progressive development and wants of our civilisation. And yet, those who love to dwell on the past, those who are not dismayed by the forbidding aspect of musty books, and feel more interest in the investigation of historical lore than in the stale and hackneyed topics of modern

literature, know well that all these subjects were handled and discussed by our forefathers with a degree of knowledge and experience which brings the blush to our cheeks, and proves that, with all the wondrous advantages we possess, the application of a new and powerful motive power to farming operations, our improved implements, and especially the truly marvellous discoveries of science, the progress we have made in the practice of agriculture is comparatively very slight indeed,—and, if we except the application of steam, which is far from general even in this country, where there are still some advocates of the flail to be found, the improvement of agricultural herds of animals, and the invention of a few really useful implements, the present state of agriculture in Europe can scarcely be said to have participated in the immense stride accomplished by those other branches of the civilisation of the world which chiefly depend upon the ingenuity of men. This I do not mean as a reproach to modern agriculturists, for that stationary position which looks so much like an anomaly in the midst of the general progress, can easily be accounted for. Agriculture being the most ancient, as it is the most necessary of human arts, is naturally the topic which has most engrossed the attention of mankind from the earliest times of the world's existence, therefore the amount of agricultural experience and knowledge recorded and handed down from generation to generation, naturally greatly exceeds that which the tradition and history of other arts can bring forward as the incentives and means to their progress.

During the feudal tyranny of the middle ages, French agriculture, in common with that of all other countries regulated by the same social laws, participated in an especial manner in the frightful disasters of that turbulent period. The slave-like condition of the peasantry, the uncertainty of their ever reaping the fruit of their labour and industry, their constant withdrawal from their fields to go and fight their restless lords' battles, the lawlessness of armed bands, ever ready for pillage and destruction, the division of the surface of the land into many petty states, under rulers, absolute, and in most cases tyrannical, to an excess unparalleled in the annals of history—chieftains acknowledging no other law but the whims of their unbridled passions, and ever making inroads into the territories of their neighbours with fire and sword, all these untoward characteristic circumstances of the long and disastrous period of our mediæval history, made it a matter of absolute impossibility that even the faintest gleam of progress in agriculture should manifest itself amidst the general darkness, that hung like a sinister cloud, over the annals of the first half of that period. It was only when the Kings of France, from the time of Lewis XI., began to put a curb upon their vassal lords, and gradually relieved the exhausted population from the incubus of feudal serfdom, that agricultural prosperity sprang from the kindly soil of France, and began to shed over all classes of society, revived with the aspirations of comparative freedom, the blessings of plentiful and secure harvests.

Under Louis XII. the grinding taxes which had exclusively been laid upon the tillers of the soil, were greatly relaxed. Under that king so justly surnamed the father of the people, agriculture began to flourish; and had it not been for the disastrous and continued foreign and religious civil wars of his successor, Francis the First, no doubt but the national prosperity of France would have enabled her to weather with less damage than she did, the frightful trials of the 18th century.

Under Henry the IV. French agriculture seems to have reached the highest point of prosperity of which its history can boast. Never in the annals of France had the population been so near the realization of that good king's celebrated wish, that every one of his subjects should be enabled to boil a fowl for his dinner. The results of an enlightened commercial policy, granting to agriculture that freedom without which it cannot

prosper, were manifest in the increase of production, which ever brings in its train increase of population. The owners of the land were wont to reside in their chateaux, and by bestowing a large share of their attention on the sources of their incomes, gave rise to a friendly intercourse between themselves, their tenants and labourers, which tended to elevate the latter, and enlighten the principles which guided their pursuits. It was in that happy reign that lived Oliver de Serres, and the immortal work which he wrote upon the agricultural status of his time will remain to the end of ages the worthy monument of a period of prosperity, which cannot be said to have been equalled even in our time.

But, alas! that prosperity was not to last; the hand of an assassin put an end to the life of the good king under whose rule it had been fostered and protected, and with his blood it seems as if the tide of progress and civilisation, peace, and religious tolerance, had ebbed from the kingdom of France, and left it the desolate arena of dissensions, and plunder, exactions and massacres, lawlessness, dire centralization and famine.

The limits of this paper do not allow me to dwell upon the political influence of historical events, or on the ruin of agriculture during the fatal period extending over the 17th and 18th centuries, further than to point out the bias of Richelieu's policy under Louis XIII. He favoured industry and commerce at the expense of agriculture, which he held in utter contempt, not to say enmity. But however disastrous that exclusive policy might have been, it was reserved to the centralization effected by Louis XIV., in order to gratify that inextinguishable thirst for pompous display which devoured him and all those whom he drew around him, to strike the heaviest blow to agriculture, as an industrial pursuit and a national interest. This centralization, which gathered around the throne a crowd of courtiers anxious for the sunshine of courtly favours, estranged the nobility from the tillers of the soil, and reduced the latter to that degraded state of misery, ignorance, and inaccessibility to improvement from which they have scarcely begun, even now, to emerge. Under Louis XVI. a new era dawned upon France, exhausted by the feuds and disasters of the two preceding reigns. Partly owing to the enlightened mind and the personal virtues of that unfortunate monarch, so effectually seconded by his minister Turgot, partly from the pressure of the new ideas, which the freethinking and infidel philosophy of the 18th century had diffused throughout society, great reforms were actually made and still greater ones were planned. These improvements in the condition of the French people soon imparted to agriculture a new life, when unfortunately the hurricane of the French revolution, and the imperial wars that followed, blew over the land, scattered under its blast the last elements of progress that remained, and threatened to bring back the French people to a state of utter barbarism, by destroying all the bonds which hold communities together—charity, benevolence, and Christianity.

Under the first Napoleon, the drain of able-bodied men was so great, that agricultural labour was almost exclusively left to the feeble hands of women and old men. Even now, although several generations have intervened, the deficiency of male labour is still lamentably apparent, and all travellers, through the eastern provinces of France especially, can testify to the fact that there are still more women than men to be seen in the fields.

Since that period a steady but very slow progress has been accomplished, although for many years it was scarcely perceptible. I shall presently examine the various causes which have been assigned for this stagnation of agricultural progress. These causes are many and serious, and as, after all, their investigation is more immediately interesting and useful as it may tend to their removal, than a lengthened disquisition on the past history of

agriculture, however alluring and pleasant this might be, I will now give a rapid sketch of what the notions and practices of agriculture were in the time of Henry IV., and devote the rest of my paper to its present state and future prospects.

Among the general notions by which agricultural operations were guided and determined in olden times, one of the most strange, and, to us, most contemptible, was the singularly scrupulous attention paid by the agriculturists of that time to the influence of the heavenly bodies, and especially to that of the moon. This superstition has, in a great measure, disappeared from France, but at the time when Oliver de Serres wrote his book, although he faintly ridicules it himself, and especially states that no great confidence should be given to astrological prognostics, yet he appears to be under the sway of the general belief in that influence, and even lays down rules for the observance of certain periods of lunar phases, in respect to field operations. The origin of this superstition is, no doubt, to be traced to the influence of our planet's satellite upon the meteorological phenomena of our atmosphere—that influence had been remarked in times of the remotest antiquity, and the observing experience of generations deprived of the light of science, naturally allowed it to degenerate into an absurd superstition. But it so happened that these prognostications, which in one district were deemed favourable for a peculiar operation, were looked upon as forbidding it in another. It had been enough for a man to observe that under a certain position of the moon such-and-such an operation had succeeded or failed, to lay it down as a rule that under similar accidents the same result must accrue.—*Post hoc, propter hoc*, being, but too often a logical axiom among the ignorant. In our times many superstitious prejudices exist, no doubt, but I am not aware that they exercise any degree of influence over the practice of modern agriculturists. These ideas, although indicating the status of scientific knowledge in those remote times, are not entitled to much consideration, for the rules by which astrological prognostics were applied to agriculture were at complete variance with one another in different districts, and even in neighbouring parishes. These rules were embodied in rhymes, in order to be more easily preserved by tradition, and are remarkable only for their quaint absurdity; not so with the other axioms which we find in the popular language of all nations, in the shape of short, pithy rhymes, which, handed down from generation to generation, seemed the sole vehicle for the store of practical knowledge which, by means of this oral tradition, was preserved to posterity. In our time we have cheap books and a cheap press, but before the invention of the art of printing, and even long after, these popular proverbs were the only practical records of the world's experience in agriculture. I say practical, for the works of Columella, Virgil, Pliny, Palladius, &c. were utterly unknown, even through the names of their authors, to the mass of the population, and especially to that portion immediately interested in the subject of which they treated. I wish time allowed me to quote here a few of the proverbs with which the work of Oliver de Serres is so abundantly interspersed. We should find in them a quaint but thorough record of acute and practical observations and maxims, which by their wisdom would corroborate many axioms and principles laid down as new discoveries in the practice of modern agriculture.

That most ancient implement, the plough, seems to have engaged a large share of ingenuity at that time. The necessity of thorough pulverisation, subsoiling, the desideratum of the spade-like effect of the plough upon the land, were fully recognised, and we have the description of a roller, not unlike Mr. Crosskill's, which I am sorry to state is now completely unknown in France; indeed, if we compare the common implements of modern French agriculture, that is, those which are used by the

bulk of the peasantry, with those which seem to have been in use in the 16th century, the latter must appear vastly superior. The description of this roller, as given by Oliver de Serres, deserves a translation:—

"From the labour of men engaged in that operation (viz., the pulverisation of the soil) great expense must ensue, on account of the time it takes. To spare that expense, an instrument has been invented of so good service, that by means of it a single man, with one or two beasts, moving it through a field, breaks more clods than ten men with spades and clubs would do. It is a large rolling harrow, composed of two cylinders or rollers as large as the cylinder of a weaver's loom, and covered with strong iron spikes, which, by the movement of the rollers, pass over the clods and crush them entirely. The weight of this harrow must be regulated by its intended effect, so that an adequate pressure may be made in order effectually to pulverise the soil."

This looks very much like a most happy combination of the harrow, clod crusher, and roller, and is, in fact, not unlike what is called in England the Norwegian harrow. I know not whether it is still in use in any remote part of France. All I can say is, that I have never seen or heard of it. The heavy plough, with wheels, drawn by four, five, or six beasts, the light plough, without wheels, and drawn by two beasts only, the double mould board, the subsoil ploughs, &c., were all in use, and considerable discussion seems to have existed about the respective merits of using horses or oxen, which shows that that question has not advanced a single jot since that time, for discussion about this point is still rife in France, and fills no inconsiderable space in agricultural periodicals and newspapers.

The equalisation of weights and measures, now so happily realised in France, and still a theme of discussion in this country, was considered in those times a desideratum of great importance. I am obliged, through want of time, but much to my regret, merely to allude to all these interesting topics, and to confine myself to the bare mention of them, in order to show what were the ideas of agriculturists, and to offer a term of comparison for the appreciation of the progress that has been made. Another great question, which although so generally practised in this country, yet is still a theme of many animated debates, I mean land drainage, appears to have been as fully appreciated in those times as in our own, and much more extensively practised than it is now in France. The means employed were, indeed, somewhat different, but the principles from which the practice is deduced were as fully known and understood as they are now. Tiles do not seem to have been known; instead of them, thorns, brambles, and even straw were recommended—a mode still in use even in England, where I have heard it strongly upheld by a man who is deservedly looked upon as a teacher in agricultural practice. Even the Keythorpe system is alluded to in De Serres' work, when he speaks of the difficulties presented by the heterogeneous nature of the subsoil.

The hoeing of rising crops, the frequent turning of the soil, the careful extirpation of weeds, the ploughing of land immediately after the harvest, especially when intended for bare fallow, the cultivation of green crops, and the good effect of their being ploughed into the soil, the great superiority of spade cultivation over any other, the importance of quick-ploughing of the land, in order to profit by favourable seasons, by means of changes of oxen, so that no delay should ensue from resting-time,—a desideratum towards the attainment of which the efforts of our modern agricultural engineers are now energetically devoted, by the adaptation of steam-power to the cultivation of the soil), &c., in fact, all the most interesting and practical questions bearing upon agricultural progress were fully known and appreciated, to such a degree, that, were it not for several advantages we have lately gained from the discoveries of science, the re-

remarkable work in which all of them are expounded might most reasonably become a text-book for practical agricultural students, even in this country.

As regards the practices of modern agriculturists in France, if we except a few spirited land proprietors, the bulk of the tillers of the soil are far more ignorant than they appear to have been three hundred years ago; for, indeed,—although no difference can be perceived in their modes of carrying on the leading operations of husbandry, such as the preparation of the soil, manuring, sowing, and harvesting, in which respects they may be said to have remained stationary,—they are infinitely behind in the general management of the farms, as regards the economy of the details, such as the care of manure-heaps, the construction of farm buildings, the breeding and care of stock, the preservation of produce, the economy of labour, and especially the theory and practice of drainage, the very name of which is still a word without any meaning with the majority of the French peasants.

With this rapid and incomplete sketch I will now dismiss the past. The present, with its stern actuality, its anomalous phenomena, and its immediate importance, has much greater claims upon our attention. I will therefore devote the remainder of the time allotted to the reading of my paper to the present state of French agriculture.

One of the greatest economists of modern times, one who may be called the father of political economy—Malthus, laid it down as a rule that the increase or decrease of population was exactly in the same ratio as the increase or decrease of the production of food.

The history of the last ten years throughout Europe affords a sinister illustration of that principle.

All at once, without any warning, a mysterious disease fell like a plague upon the potato crops of Europe, the stalks withered and blackened as if an avenging flame had passed over them, and the precious tubers, relied upon as the sole sustenance of millions of our fellow-creatures, rotted in the ground, and became a mass of putrid decomposition that even poisoned the air. It was the most awful visitation which our modern times have witnessed. In Ireland alone, one million human beings were swept from the land by the awful stroke of famine, and two millions more hastened away from the shores of that desolated island from sheer want of food, and emigrated to the United States and elsewhere. Thus a portion of this prosperous empire exhibited, within the affrighted recollections of all of us, the lamentable spectacle of a wholesale destruction of human beings from hunger, a calamity we thought only possible in remote ages of barbarism, times of savage ignorance, and impotence.

Here, then, we have an appalling instance of a decrease of population being caused by a deficiency in the supply of food. A close examination of similar facts throughout history, especially since the comparatively modern period, when the census became a regular operation in all the states in Europe, will show that there is no instance of decrease of population in any country, that is not directly traceable to a decrease in the supply of food.

Wars and epidemics may, it is true, exercise a marked influence upon the population of a country, but these causes of mortality are nothing when compared with insufficiency of food supplies. Indeed, when viewing the phenomena of the social economy of nations from this light, when measuring the deep influence which the supply of bread and meat exercises over communities, how it sways their moral* and material status, how the progress and grandeur of empires oscillate with the fluctuations in the prices of food, and how civilisation itself, with its lofty monuments of arts, wisdom, and liberty, hangs trembling in the fickle balance of plenty or scarcity, it makes the mind shudder with inquietude and terror, and causes reflecting men to turn with increased

* It is well known that crime is much more rife when food is dear than when it is cheap.

solicitude and earnestness towards the progress of agriculture, which is so immediately and momentarily linked with the progress of our race.

If, then, the movement of the population of a country be a reliable criterion of its agricultural production, we have only to look at the statistics of the population of France for the last few years, and we shall then form a correct estimate of the capabilities of her agriculture for the production of food.

Anyone looking at the geographical position of France—her favourable climate—the natural fertility of her soil—the happy variety of her surface, presenting every accident of the earth's crust; mountains and plains, gentle hills and rich valleys, broad streams intersecting its length and breadth, the genial warmth of the south combined with the moist temperature of the north, rapid germination of seeds, early maturity of harvests, uniformity of seasons, &c., &c., would naturally think that such a country was capable of supporting a very large population, and that the only evil attached to such prosperous and favourable circumstances, would be an excess of population, which would engender the usual concomitant scourges of epidemics, pauperism or emigration on a wholesale scale. Alas! it is the very reverse, which is now my grievous duty to describe.

A short time since, a powerful organ of the English press, and a celebrated Scotch review, raised a cry that France was degenerating and getting lower and lower in the scale of the human race. These statements were read with astonishment, and in many cases, no doubt, with disbelief, and yet the facts from which those conclusions were deduced are but too true. The census of 1856, in France, showed with the brutal—but plain and unvarnished logic of figures—that, whilst in every country in Europe population was steadily increasing, France exhibited a lamentable decrease, for during the years 1854 and 1855, the number of deaths greatly exceeded that of births.

Superficial writers might, indeed, naturally infer from such a phenomenon, that the French race had reached a period of degeneracy and impotency, but the cause lies elsewhere, for I will show presently that the number of marriages had also sensibly decreased ever since 1850, thus accounting, in a certain measure, for the decrease of the population. The fact of this extraordinary phenomenon cannot be ascribed to any other cause but insufficiency in the supply of food. The high prices which, up to the present time, have prevailed in Europe ever since 1853, connected with the Russian war, which drained the country of money and men, paralyzed, in a sensible degree, agricultural operations; and French agriculture, deprived of capital, as I will presently show, destitute of that improved machinery, which goes far to supply the lack of hand labour, was wholly unprepared for this sudden call of active men which depopulated her villages and for that drain of capital, which was swallowed up to an untold degree immediately by the popular Government loans, and indirectly, but not less fatally, by the enormous sums of money spent in the purchase of foreign supplies. To these causes we must add the unfavourable temperature of those eventful years, which, in undrained land and impoverished soil, fatally reduced the yield of harvests.

But, however satisfactorily we may account for this deficiency in the supply of food during the last five years in France, this does not explain why other countries, which, during the same period, were placed in precisely similar circumstances, did not exhibit the same retrograding symptoms in their prosperity, for, on the contrary, in spite of these adverse circumstances which told with such remarkable severity in France, they steadily persevered in their onward career of progress and prosperity. But, in order to obtain a still more convincing proof that the cause of the slow increase of population in France is directly traceable to the insufficiency in the supply of food from the low status

of agriculture, let us examine the statistics for the last 50 years.*

In 1790, from a census, decreed by the Constituent Assembly, the population of France was found to be 26 millions and a-half; 25 years afterwards, in 1815, it was most likely 29 millions and a half, which gives an increase of three millions—notwithstanding the frightful wars that raged during that whole period. Thirty years after, in 1846, the population had reached 35,400,000, increase, six millions; ten years after, in 1856, it was only 36 millions, which gives an increase of only 600,000 souls.

From the foregoing data it will be seen that, during the revolutionary and imperial era, population increased at the rate of 120,000 per annum; during the monarchical period which ensued, at the rate of 200,000; and, during the ten years which have elapsed since 1846, the average is only 60,000. I say, average, for ever since 1850 the proportion has been still less. In 1849, immediately after the revolution, the disquietude and stagnation into which all the interests of the French people, and especially that of agriculture, were suddenly thrown by that fatal event, were made manifest by a sudden decrease in the number of births, which exceeded that of deaths by only 13,000, notwithstanding the plentiful harvest of 1848—which, however, barely sufficed to fill up the deficiency caused by the famine of 1846-47. In 1850, a reaction took place; confidence was restored to a certain degree; the violent scenes exhibited by an unhinged society had ceased; the population, comparatively less disturbed, returned to their labour: the production of food increased, and with it the population, which, in that year, showed a surplus of 187,000 births. In 1851, 1852, and 1853, however, the downward progression began; in 1852 the surplus of births, which, in 1845, was 237,000, came down to 154,000; in 1853, to 142,000; but in 1854, that downward movement crossed the line, and appeared on the lower side with a grim surplus of deaths over births of 69,000. The year 1855 exhibited the same mournful phenomenon, although in a lesser degree; the surplus of deaths reached only 37,074. Thus, in two years, while every country in Europe exhibited a comparatively large increase of population, the numbers of the French people had actually diminished by 106,000.

Thus, to resume the picture of this lamentable decadence, I will state that from 1841 to 1846, a period of five years, population in France had increased by 1,170,000; from 1847 to 1851, this increase only reached 383,000; and from 1852 to 1856 only 256,000. Now, before we examine the cause of this phenomenon, let us see what was the relative position of other states as regards population.

In 1851 England was already twice as thickly populated as France at per square mile, and the excess of births over deaths averaged about 360,000 per annum. It is very true that in this country, as M. de Lavergne remarks in his paper upon the census of 1853, published in the *Revue des Deux Mondes*, the production of food supply does not keep pace with the increase of population; that production must, however, be considerable, because on the one hand emigration has greatly diminished, and on the other the importation of food is by no means adequate to the increase of population. It may then be safely inferred, that agricultural prosperity is the very foundation of the colossal power of England, the greatest the world has ever known, not excepting even that of the Romans, who never swayed power over more than 100,000,000 of men, whereas the British empire cannot be less than double that number.

Belgium, whose territory is but one-twentieth of that of France, from 1851 to 1856 increased its population from 4,427,000 to 4,607,000, which gives a surplus of

* For the following digest of statistical tables I am principally indebted to the remarkable articles on population, from the pen of M. Leonce de Lavergne, and lately published in the *Revue des Deux Mondes*.

180,000; at the same rate France should have gained 1,500,000, and, as I have stated, the increase of her population during that period was only 256,000.

In Prussia, where the census is taken every three years, the population increased by nearly one million in six years; at that rate, the increase in France ought to have been two millions.

In Holland, from 1850 to 1856, the population increased by 204,000, at which rate the increase in France should also have been two millions.

The decrease of population in France results from two sources. On the one hand the number of births has diminished; that of deaths has likewise increased. For instance, the number of deaths, which in 1853 had been 296,000, rose in 1854 to 492,000, nearly 200,000 more. It is true France was at war with Russia, but it appears from authentic statistics, from the War-office, that the total loss during the Russian war, both in the army and navy, and from all causes, was only 70,000.

Now let us look at another item of statistics—the number of marriages. This we shall find also decreasing.

In 1850 there were 297,900 marriages.

1851	"	286,884
1852	"	281,460
1853	"	280,689
1854	"	270,906
1855	"	212,773

So the decrease has been following almost a geometrical progression. In 1855, there were 85,127 marriages less than in 1850.

There cannot be any doubt that an increase in the population of a country is a positive element of prosperity, provided the supply of food increases in the same ratio; without that indispensable condition, it is a positive evil. Epidemics and emigration must re-establish the balance, or else the nation must exhaust its financial resources in the purchase of food from foreign countries. Therefore, increase of population is not always a sign of prosperity, and it can be an immediate cause of ruin. If population were to remain at a stand-still, and the resources of the country were to go on increasing, so that the means of each individual should benefit by that increase, this stand-still would be an immense benefit. But statistical science tells us that such positions are merely impossible. For, on the one hand, an abnormal increase of population, without a corresponding increase in the supply of food, is sure to lead to fearful mortality and misery, which, by diminishing the number of marriages and births, soon bring down the number of the inhabitants within the limits of the supply of food; and, on the other hand, the tendency of the human race to multiply itself is so energetic, that, in times of prosperity, that is, when food is cheap and abundant, it requires only 25 years to double its numbers. Therefore, those who might argue that, although the population of France may not be increasing, yet her resources are being rapidly developed, and her material prosperity is the more securely progressing as it is shared by fewer individuals, fall into a grave error, for I will presently show that French agriculture does not produce a sufficient supply of food even for the stationary, if not decreasing, population of France, and I will also prove that her material prosperity, such as it is manifested by great enterprise, and useful public works, bears no comparison with that of her neighbours, with perhaps the exception of Spain and some petty Italian States. But some will no doubt point to the magnificence of Paris, the gigantic embellishments which have been achieved of late years; others may refer to the net of railroads which is being steadily carried all over the country, &c.

Now, let us examine those two symptoms of prosperity. A very few considerations will suffice to show how deceitful they are.

Paris, it is true, has been greatly embellished; its population has increased in a few years by at least 300,000

inhabitants; immense sums of money have been expended in pulling down its narrow streets and rebuilding others; in erecting palaces; making fairy-like parks, and public gardens, &c., but at whose expense? The reply is a forcible one—at the expense of agriculture. The 300,000 additional inhabitants chiefly consist of mechanics and labourers removed from the country. In 1856 alone, the number of labourers, principally masons, who left the department of La Creuse exceeded 50,000, the total population being 287,000. This wholesale emigration represented the sixth part of the inhabitants, and the able-bodied proportion being about 1 to 6, it follows that nearly the whole valid portion of the inhabitants of that department emigrated *en masse*. In the provinces of La Marche and Limousin there are now scarcely any able-bodied men left, and the cultivation of the soil is literally suspended. Add to this centralisation of highly-remunerated labour upon one single part of France, the 500,000 able-bodied men which conscription takes every year to renew the ranks of the army, and you will easily realise the deficiency of agricultural labour that must ensue throughout the land. Then, what an amount of treasure lavished upon Paris alone! whereas so many parts of France are still almost inaccessible from want of agricultural roads; if a due proportion of that money was spent in draining, making roads, and other useful improvements, there might be less splendour, perhaps, but there would be a far greater degree of substantial wealth and prosperity. To give an idea of the enormous disproportion of expenditure for public works in Paris, as compared with the whole of France, it will suffice to state that, in 1855, the whole amount of public money spent in improvements throughout the country was £84,080,000, out of which Paris alone absorbed the enormous sum of £35,080,000, nearly the half of the whole amount. Now about railways. If we examine the relative proportion of miles opened for traffic, we find that in England there are proportionately ten times more than in France. Belgium and Germany exhibit also a large superiority in that respect. But as a last proof that the standstill of the population in France is not attended by an increase of wealth, and especially agricultural wealth, let us examine the official return of food importations for the year 1856, and we shall see whether, with her reduced population, France is able to find in its agricultural resources a sufficient supply of food. But before I give the official figures, allow me to remind you that the population of France is only to that of England as 68 is to 100, whereas her home production of food is only one-third of that in England, Belgium, and Holland, two-thirds of what it is in Germany and Lombardy, and it hardly comes on a par with the less populated and worse governed portions of Europe, such as the Italian peninsula, Spain, and Portugal. The importations of agricultural produce in 1856 were as follows:—

Cereals	£12,120,000
Rice	1,400,000
Dry vegetables, and other farinaceous food	280,000
Cattle	2,240,000
Meat, fresh and salted	320,000
Butter and cheese	440,000
Wine, spirits, and beer	2,160,000
Table fruit	720,000
Olive oil	1,000,000
Silk	9,880,000
Total	£30,560,000

This is important, as it expresses the exact deficiency in the agricultural produce of France for a whole year, and constitutes, after all, the most accurate agricultural statistics. Only calculate what a difference the production of food can make in the wealth of a country; supposing French agriculture to be as prosperous as it is in

England, in Belgium, or in Holland, instead of having to pay foreigners 30 millions of pounds a year, France would be enabled to export double that amount, so that she would realize an annual profit of nearly 100 millions sterling!

This calculation, which gives the measure of what French agriculture could do, alas! gives also that of its shortcomings and poverty. Let us now examine the actual causes which contribute, directly and indirectly to this lamentable inferiority.

Among these causes, the division of property has often been cited as one of the most destructive. For my part, I believe the evil influence of that system is more apparent than real. In the first place, property in France is far less divided in reality than appears from the number of property-tax schedules. The number of schedules, or as they are called, *cotes foncières*, do not represent the number of land proprietors, because there is a schedule for every portion of land owned in a special district. For instance, I own a property in the neighbourhood of Lisieux, in Normandy, which happens to be situated upon the limits of three districts, and I am returned in three schedules for the same estate. In the second place, the average of children in French families does not exceed two and a-half, so matrimonial alliances, especially with the dowry system, go far to reconstitute properties divided by succession. In many cases, an equivalent in money is given to daughters, so the landed property remains to the son. Where there are several heirs to a property, it is also frequently sold and the money divided; such land is either bought whole, and, of course, suffers no division, or, more frequently, is bought by a neighbouring proprietor, near whose property it lies, and thus increases other estates, producing the very reverse of division.

Of course, I do not attempt to deny the advantages of large estates, as regards agricultural prosperity, but I do not think that in France they would be attended with the same advantages as in this country. Extreme division of holdings is certainly a great evil, and a fatal obstacle to agricultural progress, but with the lack of capital among French agriculturists, moderate-sized farms are a positive advantage. With the limited means at their command, French farmers can hardly cultivate what they hold: how could they be expected to succeed better with more extensive holdings? With no drainage, few cattle, no artificial manure, scarcely any sheep, except in districts where little corn is grown, and no capital, farming on a large scale is wholly out of the question. I have just mentioned drainage, cattle, sheep, and artificial manure; let us examine how French agriculture is situated in respect to these life springs of agricultural prosperity.

There are in France no less than 30,000,000 acres that want drainage, and out of that immense surface there are only 86,000 now drained, 20,000 of which belong to one single department, that of Seine and Marne, where some of the best farming in Europe is to be seen.

France possesses about the same number of sheep as England, but the difference of size, weight, early maturity, and quantity of wool, even setting aside the difference in the surface of both countries, establishes an immense superiority for England, which besides breeds and feeds twice as many heads of cattle per acre. As regards artificial manures, I will only state that out of 223,000 tons of guano that were shipped from the Chincha Islands in 1854, 113,000 came to England, 98,000 went to America, and only 5,688 were landed in France. The absurd navigation laws, which allow guano to come to France only in French bottoms must, as a natural result, enhance the price of that precious manure, so that it is dearer in France than any where else. Superphosphate is almost unknown, the only artificial manure employed in any considerable quantities being animal black and poudrette.

The manufacture of agricultural implements, which

in this country has reached such gigantic proportions, scarcely exists as an industry in France. The rude implements used by the peasantry are generally manufactured by village mechanics, from old and unimproved patterns, handed down from generation to generation. The importation of modern implements from England and Belgium, although the duty has been greatly reduced, is next to impossible, from the vexatious formalities exacted by the Custom authorities. Besides, improved agricultural machinery must always remain out of the reach of the French farmer, not only from the almost impossibility of importing it from other countries, but especially from the high price of iron, which is kept up by protective duties to the great detriment of agriculture. The consequence is, that land in France is ill-cultivated, ill-cleaned, ill-sown, ill-reaped, and overrun with weeds, which foster undisturbed amidst meagre crops, one-third of which they destroy by robbing them of their nutriment.

Such, unfortunately, is the prevalent and general state of agriculture in France—and to this state must be ascribed the cause of that deficiency in the production of food which exercises so fatal an influence over the population and prosperity of the country. But I should render myself guilty of partiality and injustice were I to omit to say that in the midst of that degeneracy, there are bright spots, significant symptoms of revival, which bid us hope for a rapid improvement. The late political revolutions have caused many eminent men, whom public duties and honours had called to the capital, to withdraw to the peaceful and soothing scenes of their rural abodes, seeking that *dulce otium* so beautifully sung by Horace in one of his happiest odes. Others, keeping aloof from a government with which they have not only no sympathy, but for which they actually entertain a hostile feeling, have passively withdrawn from active interference in political interests. These men have soon freed themselves from the hold which the gaieties of the Paris world, had once upon their habits and tastes, and, quietly settled in their chateaux, they have applied to the improvement of their patrimony, and the advancement of agricultural progress within the sphere of their influence, the enlightened energies of their spirit, and the savings which a retired and simple country life, enabled them to realise upon their incomes. Ever since the revolution of 1830 this movement has steadily set in. In 1848, that period of excitement, by stirring old party expectations and sympathies, mouldering but not extinguished, checked it for a time, but since the establishment of the empire, all those who have escaped from the fever of speculation or ambition have once more returned to the fields, and the effect has been that the old French society of the Faubourg St. Germain is almost extinct in Paris; in its stead there has sprung up a society of monied men, wealthy to-day, ruined to-morrow, who have brought into the very constitution of their social circles, those reckless and loose principles which operate with an immediate action upon the raising up and the downfall of the fabric of their fortunes. It is a well-known fact that within a radius of 20 miles around Paris, the landed property changes hands every twenty years.

Unfortunately, French landed proprietors as a class are poor in capital, and this disadvantage especially falls upon those who devote themselves to agriculture; hence the slow pace of improvement. This drawback is still increased by the singular notion, that every shilling spent in improvements upon the land is utterly lost. This notion is pretty general through all classes of society in France. It is an undisputed axiom among landed proprietors, that landed property does not return them more than 3 per cent., which is pretty correct, if we consider it only as an investment for capital; but they do not consider that, to that low rate of interest, must of course be added the profits realised by the farmer. It is very obvious that if we consider agriculture as an industrial interest, which it really is, we must allow that it requires a certain outlay, like other manufactures, before it can bring

a return. Experience tells us, that there is no raw material that yields so bountiful a reward as land, when money is liberally and judiciously spent upon its improvement. But, owing to prejudices on the one hand, and the want of capital on the other, the efforts hitherto attempted have been timid, grudgingly made, and, in too many instances, abortive, for want of sufficiency. Nevertheless, the more general attention of land proprietors to their estates, the growing taste for agricultural pursuits among them, is one of the happiest symptoms of progress, because it constitutes a practical incentive to that progress among the truly agricultural class, I mean the peasantry, by setting them an example, the only argument that has any hold upon their understanding.

The class of English farmers cannot be said to exist in France. With some few exceptions, in the northern districts and around Paris, the peasantry is not above the class of labourers in England, and by no means so intelligent. Their long possession of the soil, their isolated position which leaves them outside that general movement of civilization only felt within the sphere of centralization, when centralization exists in a community to so great an extent as it does in France, and the narrow limits of their ambition, have hitherto smothered every germ of improvement in their minds or in their material position. Having no capital, they can barely obtain from their little holding enough to pay the rent, and eke out a coarse subsistence for their families. With the surplus of the rye, barley, or buck wheat, which have not been sold to pay the landlord, they knead the dark loaf which forms their staple food; with the wool of their scanty flocks they spin and weave their rude garments; meat they scarcely ever taste. Poverty and the vicissitudes of produce from a soil so ill cultivated, have necessarily engendered among them penurious and miserly habits. What money can be saved from unheard of privations is hoarded up and concealed in old cupboards, and lies totally unproductive. Not even the faintest glimmer of modern commercial policy has yet penetrated into that class, and, generally speaking, they have no idea of credit or bills of exchange. They never avail themselves of the machinery of banks; all their transactions are in hard cash, and not many years ago they did not even know gold. I perfectly remember a farmer, a perfect stranger to me, stopping me once in a country road to ask me if I knew gold, and showing me a few gold coins he had just received in payment at the neighbouring town, evidently with very serious misgivings as to their value. There cannot be any doubt that, even in the present day, there is a vast amount of bullion treasure hidden in France—buried in hiding-places. The singularly successful loans effected by the emperor, at the time of the Crimean war, when, in a few days, and from the lower classes, twenty times the amount wanted was filled up, is a sufficient proof of that lamentable fact. And yet there cannot be any doubt that, in the French peasantry lies the strength of the country. As a body, they are sound and staunch; their vices are no doubt the result of the neglect in which the system of centralization has abandoned them; but their virtues are untouched, and those virtues are of the same stamp as those of the forefathers of our degenerate modern societies—those of the early Romans, who handled, with the most natural transition, the plough and the sword, and who wrought, by their stern virtues, the foundation of that gigantic power which an effeminate posterity let slip from their feeble grasp. The French peasantry are patient, sparing, religious, and highly moral. Conscriptio draw every year into the ranks of the French army at least 400,000 of their robust sons, and a thousand European battle-fields, reddened with their generous blood, have proclaimed, in triumphant and glorious records, how they can die and conquer. Once get the thin edge of progress into their traditions; let a gleam of enlightenment kindle their hard and miserable career with a beam of sunshine; let a little more comfort cheer their

homes; let a more extensive range of ambition widen the sphere of their activity; let a little more capital improve their land; let their commons be divided or alienated to spirited and enterprising agriculturists; let their breeds of cattle be improved by the infusion of better blood; let banks of credit introduce into their trading habits less cumbersome modes of dealing; let them understand the use and value of money, which derives life and production only from quick circulation; let a rational education, suited to their wants and requirements, burst open the stolid crust of blind routine that enslaves them, and the French nation will rise great and powerful from inherent and intrinsic worth and strength, for she possesses in her peasantry, which is the bulk of the population, the moral stuff wherewith great and glorious communities are formed.

The higher classes in France, owing to the absolute sway of the government, which buys and sells them with honours, lucrative posts, and a boundless patronage, have little or no influence; those that are honest are generally poor and inactive. The monied class, and what is called the bourgeoisie or trading class, are rotten to the core; they have no religious creed nor principle. Sensuality and selfishness are the two motive powers of their thoughts and actions, the rankest infidelity unbridles in them the brutish appetites of human nature; and the riches they acquire only serve to pander to their vices. Alone, the rural population has preserved those primitive virtues of innocence and morality which are the real strength of a nation, and without which it must decline and fall, and even totally disappear from among the ranks of the human race.

But, I may be asked, has the French government done nothing to revive agriculture? There is a minister of agriculture; there is a large and influential staff of agricultural inspectors; there are innumerable government model farms, agricultural colleges, breeding establishments, where the best English cattle are kept; there are shows, both local and general; there have even been some called universal and international. We have heard of a vote of 4,000,000 sterling for drainage; there is a bank of *crédit foncier*; very large sums of money are spent from the consolidated funds and from local resources, in liberal prizes and encouragement; surely all these must have exerted a considerable influence upon French agriculture, and given an extraordinary impetus to its progress.

We have all heard of—and some of my audience, perhaps, have seen—a strange and somewhat awful experiment performed by means of a galvanic pile upon a corpse. A wire is put in communication with the spinal marrow, and life, movement, and action are restored to the muscles; the corpse will stand erect, open its eyes, move its arms and legs; its livid lips will quiver as if they were going to speak, and to all appearances death has been conquered, and the corpse lives; but only interrupt the mysterious current from the pile, and the lustre of the eyes will vanish, the arm will fall inert; the jaw will hang, the eyelids will close, and the ghastly corpse will fall to the ground, once more a helpless mass, on the verge of decomposition. In like manner the action of the French Government props up a show of activity, a show of vitality, in the French agricultural interest, but it exists only on the surface. Who are those who exhibit at the shows? they are only a few amateur fancy farmers, and the specimens they exhibit very often constitute the totality of the stock they have on their farm, and are by no means a sample of the agriculture of their districts. The farmers, with very few exceptions, are not only not exhibitors, but not even visitors. The schools have been productive of very little good. As farms, they have been lamentable failures, and the peasants point to them as instances of the folly of modern ideas; in fact they do not pay, and as model farms, they ought to pay. The *Crédit Foncier* is only a loan establishment upon mortgages, a gigantic pawn-broker's shop, too intricate and formal in its working to

be of any real utility. As to the grant of 4,000,000 sterling for drainage purposes, it exists only upon paper, not a sou of it has yet been applied, or I verily believe even asked for. The fact is, that the government interferes too much with agriculture; they assume too absolutely the guidance of progress, but they only turn within a vicious circle, fancying they go a great pace and accomplish a long journey, when, in reality, they only turn within a ring. Nothing is left to private enterprise, and, on the contrary, if anything be attempted from private initiative it is immediately snubbed and put down. The result is, that so much dependence is placed upon government initiative, that, wherever the immediate action of the state is not exerted, no institution, no society, no common interest can arise from local necessities and wants, and that individual energy which local necessities invariably start into existence, when the action of society is unfettered and independent, lies dormant and inactive, because a universal state tutelage enthral the whole community in indolence and careless indifference. All this show of vitality is therefore a sham, the result of a temporary galvanic current. Let the state cease to interfere, and all this brilliant activity will vanish, and the poor agriculture of France will appear what it really is, an inert corpee, scarcely retaining the spark of life. And how can it be otherwise? It bears the huge incubus of a property-tax amounting to 20 per cent. of its gross produce. All the raw materials necessary to its operations are saddled with a heavy import duty, just to favour a few ironmasters and manufacturers, who fatten upon this exclusive and partial protection. In order to favour navigation, guano is made dearer than anywhere else; salt is the object of a monopoly which renders its use an impossibility, although a portion of the impost is remitted for agricultural purposes, yet, the formalities to go through, and the expense of rendering it unfit for any other use, are such, that it would be cheaper to pay the full price of the monopoly. Agricultural implements cannot be obtained, except at a ruinous expense. Such, then, are the stumbling-blocks which a rational government ought to remove; and these once removed, private enterprise and institutions ought to be encouraged, and the dangerous interference of government gradually withdrawn. For the experience of history, particularly in England, convinces us that, the less the government of a country interferes with the independence of commercial and industrial interests, the more they prosper, and the firmer is the base upon which their structure is built.

But, however desirable independence of individual action may be, generally speaking, there is one point in which the direct influence of the State may be brought to bear with great advantage, and that is—the application of the power of public means to the realization of great enterprises, entailing, by their success, a great amount of public advantage. In France, such a course is still more necessary than in any other country. because, as I have stated, the people are accustomed to trust to the Government's action for almost every public and local interest. I principally allude to the draining, enclosure, and cultivation of the commons and Government lands, which, in their present undrained state, are a source of misery, pestilence, and sloth, and which, by means of improvements by no means difficult of execution, might soon be metamorphosed, as by the touch of a magic wand, into plains of unlimited richness and fertility.

The French emperor seems at last to have become aware that, without a greatly improved agriculture, the country he governs cannot become truly powerful, truly great, and truly prosperous, and, which is of vast importance to himself and his dynasty, truly tranquillised and internally settled. He has lately applied to the revival of French agriculture the energetic activity of his mind, and, impatient of the obstacles of routine and

official formalities, he is striving, by personal example, to give a salutary impulse to the whole ponderous and musty fabric. He has purchased whole tracts of waste lands in various parts of the empire, selecting the poorest and the most desolate. His will and his money have trampled down every difficulty, and started fields and farmsteads into existence, where but yesterday nothing was seen but pestilential swamps and barren sands. Having become a farmer, let us hope he will soon feel all the disadvantages under which the farming industry of France is groaning, from restrictive and unfair commercial laws which his power can repeal. Should this be the only good record of his reign, it will suffice to hand down his name to posterity as a benefactor to his country.

And now, in conclusion, allow me, as a matter of duty, to pay a homage in which men of all nations and all classes will readily join, to those eminent Frenchmen who by their researches and profound studies have cast such a vivid light upon the hidden mysteries of nature, especially those of vegetable physiology, and thereby have accomplished so great a progress in the agriculture of the whole world. When I name such men as Dombade, Gasparin, Payen, and Boussingault, you will admit that, if there is a dark side to French agriculture, it has also a most brilliant obverse. With such names inscribed upon her banner—with such leaders as her sovereign, and spirited landed proprietors—and with such a phalanx as her peasantry, surely French agriculture cannot perish or remain at a stand-still. Her steady tramp is already heard on the arduous path of progress, and, with the indomitable courage and endurance of her sons, and the inexhaustible advantages of her clime, she shall achieve the victory.

DISCUSSION.

Mr. S. SIDNEY said he rejoiced in the circumstances which had induced Monsieur de la Trehonnaie to take up his residence in this country, as those interested in agriculture had thus the advantage of listening to his eloquent speeches at their great agricultural meetings, as well as to the very able paper which they had been favoured that evening. M. de la Trehonnaie had drawn a vivid picture of the French peasantry; men labouring industriously day by day throughout the year; living upon the plainest food, and but seldom tasting meat, and yet, in spite of all these sacrifices, they scarcely succeeded in producing a sufficient supply of food to meet the general wants of the nation. That picture scarcely sufficed to give an idea of the agricultural districts of France. One might travel in that country for hundreds of miles—avoiding the large towns—and one would only meet with people of the humblest class. There were but few properties to be seen which could bear comparison with one of the 250 acre farms in this country. The country was dotted over with villages, in which was to be found scarcely a single house of importance except the residence of the government official or the police officer. The general condition of the French agricultural community was that of a large collection of peasant proprietors, with scarcely any capital, cultivating the soil with the most praiseworthy industry but with the smallest amount of skill. The result of this state of things, was, as had been truly represented by M. de la Trehonnaie, that agriculture, instead of progressing, had retrograded. Those who had read Arthur Young's description of France before the great revolution could not fail to come to this conclusion. French agriculture laboured under the disadvantages of fiscal laws which seemed to be based upon the principle of discouraging all importation, under the idea that exportation could be carried on to a large extent without involving the necessity of importing anything. He could not help observing that all writers upon French agriculture avoided touching upon the point which he had always

regarded as the greatest impediment in the way of agricultural progress in France; that was the division of landed property. In regarding the condition of agriculture in France, they must take into consideration the fact, that about 60 years ago, a very large portion of land was confiscated and sold at a very cheap rate, and fell into the hands of the peasant cultivators of the soil. Let them conceive what would be the condition of things in this country in the present day, if within a short period the farmers had had an opportunity of acquiring large tracts of land at one-third of its value. But, notwithstanding this, agriculture had declined in the way described by M. de la Trehonnais; and he (Mr. Sidney) thought that this was owing, in a great degree, to the state of the law in France, with respect to the division of property, which he submitted was such as to prevent the development of the agricultural resources of the country. The law was that upon the death of the father the land was to be equally divided amongst the children or successors with the exception of one-third. The consequence of that system was that the land was burdened with mortgages, and the agricultural families were occupied in arranging, with the skill of rural Talleyrands, how their plots of land might be kept together in sufficient extent for cultivation. He believed it would be found that 25 acres was beyond the average extent of occupations in France. M. de la Trehonnais had correctly stated that in that country farmers were not to be found like those in England. This he (Mr. Sidney) believed was to be traced to the system of compulsory division of property. In England the landed proprietor provided the necessary farm buildings on his estate, and, in many cases, also furnished the capital for the efficient drainage of the land. It was thus prepared for the tenant farmer, who brought his industry, skill, and intelligence to bear upon it. But the system in France was totally different. In order to have wealthy landlords, they must have comparatively rich tenants. Arthur Young had stated that good farming implied much labour and much capital, but in the French system they had neither of these. Still it was impossible to mix with the working classes of France without being struck with the energy and skill they displayed in their business pursuits, and they were driven into the large towns as being the only real fields for enterprise. In this country a man who invested his money in land, inherited the traditions of the landowner. He was satisfied with a moderate interest for his money. He wished to keep the land for his successors, and hence his desire was to see a flourishing tenantry around him. He did not regard the money expended as lost, although it might not return interest for seven or ten years, because he considered it as an investment for his posterity. But, on the other hand, it was stated that in France the land changed ownership, upon the average, every 20 years. The great landed proprietors of England, men of large capital, had devoted their attention to the improvement of their estates, with the best results to agriculture. He might point to such men as the Bedfords, the Spencers, the Yarboroughs, and a host of others. Those were the men who had expended vast sums upon their estates in providing the necessary materials for the tenants to work upon, and who had done so much for the agriculture of the country. Their successors would inherit the traditions of their fathers, and thus the march of improvement would steadily continue.

Mr. J. J. MECHI could not allow that opportunity to pass without expressing his warm admiration at the comprehensive manner in which this great subject had been treated by his friend, M. de la Trehonnais. He (Mr. Mechi) would hardly venture an opinion as to the causes of the present condition of French agriculture, but he believed that the influences which had tended to injure agriculture in Ireland applied also to France—namely, non-residence, and the absence of a poor-law system. Political influences, no doubt, had something

to do with the matter. In England the possession of land gave a political status, which rendered that description of investment a favourite one. At the same time he (Mr. Mechi) was not competent to give an opinion as to whether such a system could be introduced in France. With regard to roads, he did not know whether the parishes were indictable for neglect in not keeping them in proper repair. There were many practical questions connected with French agriculture into which he would not enter. It must be admitted that the French stood foremost in the ranks of art and science, but he agreed with M. de la Trehonnais that the system of centralisation in France had gone very far to prevent the development of those powers which, as a people, they were known to possess. He was glad to hear that at one period, at least, agriculture was prosperous in France. Any disturbance of the security of property would seriously affect agricultural interests, and one great cause of the progress in this country was the perfect reliance that was placed on our laws to protect the property of every individual, and the security which was universally felt that any capital invested in improvements in land was safe, however distant the prospect of remuneration.

Mr. RAMSAY addressed the meeting at some length upon the general topics treated of in the paper. He could have wished that less space had been devoted to the political economy of the question and that a larger share of attention had been given to the comparison of the agricultural state of the two countries. He agreed with the preceding speaker that much of the evil in connection with agriculture in France was attributable to the absence of the law of primogeniture; and so long as that was wanting they could not look for any great improvement in the agricultural condition of the country. He instituted a comparison between the present state of things in France, in connection with the landed interest, and that which existed in Ireland previous to the operation of the Encumbered Estates Act. Previous to that time, the people actually perished in starving themselves by the cultivation of potatoes as the staple food, but when the land changed hands, the cultivation of superior crops was introduced, which afforded to the people a higher class of food and better remuneration for their labour. Some such system was required in France before they could look for any marked improvement in the agriculture of that country.

Mr. G. F. WILSON, F.R.S., said, as it was probable some present would wish to look a little farther into the first part of this interesting subject, with reference to the state of agriculture in the 16th century, he would mention that in a book entitled "The Life of Palissy the Potter," written during the time of the Huguenot persecution, some highly interesting remarks, suggestive of improvements in agriculture, would be found. In some material points, they coincided with the improvements that Mr. Mechi and others had urged with so much earnestness and ability in these later days.

Mr. THOMAS SCOTT remarked that the agriculture of France had a peculiar character of its own, and he had hoped that this paper, coming from an eminent practical agriculturist, would have described in detail the development of that peculiar system which France possessed. M. de la Trehonnais concluded his paper by stating that the government was now interfering in agricultural matters, and added the sound political maxim that trade thrived best apart from governmental interference. Nevertheless, for his own part, he thought much was due to the great man who now ruled France, for the steps he had recently taken in reference to the agriculture of that country. He was a man imbued with our English system—not only of agriculture, but also of political economy; and he believed it was well known that the Emperor had a strong desire to relax the stringent fiscal regulations which interfered so much with the prosperity of the commerce of France as well as the advancement of its agricultural interests. But in the

peculiar position in which he was placed, the question arose whether he could do so with safety. The Emperor had promoted agriculture by the exhibitions which had taken place under his auspices, and by the government grant for drainage purposes. Under these circumstances he could not go with M. de la Tréhonnais to the extent of saying that agriculture in France should be still left to its own resources. The late agricultural movements in France had had a favourable effect; but that the Emperor would, in his generation, be able to effect the reform of the entire political as well as agricultural system of the country he thought was extremely chimerical, and to try all at once to engraft our own improvements upon a people who had at present no knowledge of those improvements, and who were, for the most part, ignorant of the implements used in this country, would be altogether out of the question. The shows of cattle, the importation of English implements of agriculture, and the great example of cultivating model farms, which the present Emperor of France had so worthily set, could not but be beneficial to the agriculture of France, which, he thought, must be regarded as the backbone of its national prosperity.

Mr. ELLIOTT thought that M. de la Tréhonnais, in his desire to treat this subject with the strictest impartiality, had scarcely done justice to his countrymen. He thought he had not fairly shown the present physical condition of the French people, as compared with 30 or 40 years ago. The facts as to the diminution of births and marriages, as compared with the increase stated to have occurred in deaths, he thought did not quite prove the conclusions at which M. de la Tréhonnais had arrived. Without any information as to the average length of life, they could not arrive at a just conclusion, for a mere decrease of births and marriages, and an increase in the number of deaths, was not inconsistent with the improved condition of a people. He thought a fair examination into the social condition of France, would show that with a diminution in the number of births, and therefore a diminution of its population, there had been a very marked increase in the quantity of food produced in the country. It might not be as delightful a state of things as we had in this country, where we had an enormous increase of population co-existing with the increase in the production of food and the other material elements of well-doing; but it might happen that the state of France was, apart from political disturbing causes, more safely progressing than our own. The excessive development of population and industry in this country might carry us a little beyond the element of safety. Mr. Elliott proceeded to remark upon the great improvement he had noticed, as the result of close observation, in the *physique* of the French people as compared with former periods. He considered that this had been improved during the last 20 years, to the extent of 25 to 30 per cent. He had particularly noticed this in Paris, and he believed that the same might be said as to the inhabitants of the provinces. But whatever might be the feeling of rivalry between the two countries, it was a great gratification to find, notwithstanding all the unfortunate circumstances in which France had been placed, that there was an immense improvement apparent in the physical condition of the people. They were much better fed and better clothed than formerly, and far from lamenting over the circumstance of the diminution of births, he thought that was one of the means by which the French people would adjust the population to the quantity of food they produced.

Mr. PEABALL remarked that the extensive colonization now going on amongst the French people was a circumstance worthy of consideration in the discussion of this subject. It sometimes occurred that, in Algeria alone, there were 80,000 troops. The climate was the most beautiful that could be imagined, and the French were invited to colonise there.

Mr. WILLIAM FISHER HOBBS said he had been highly interested by the paper read by his excellent friend, M. de la Tréhonnais. He thought that gentleman, like too many others of his countrymen, out of compliment to the English farmers, had placed the agriculture of France below its true merits. During the last three years his experience and observation of French agriculture had been somewhat considerable; and he must say that the remark which had fallen from previous speakers had placed the agriculture of France in a very unfair position, according to his opinion of it. Indeed, Englishmen visiting France usually only took a very superficial view of the state of the country, and had rarely much opportunity of close observation. Some had also argued upon the extent of the productions of France from the agricultural statistics of that country. He begged to say that they formed no criterion as to the actual produce of the soil. The agriculturist of France was taxed much more heavily than the agriculturist of England, and there were so many schedules used in the collection of the statistics that he did not believe they exhibited the real produce of the land. It had been stated that the character of the agriculture of the country was to be judged from the fact that the land changed ownership every 20 years; in England it was calculated that the land changed hands every 30 years, therefore he did not think that fact went for much. From what he had himself seen of the agriculture of France, there were farms of 800 acres, within 50 miles of Paris, which would bear comparison with any farms in any part of England or Scotland. In fact, he had seen as good practical farming in France as in England. With reference to the agricultural labourers of France, he need only go back to the great gathering at Paris in 1856, to show that in education, manners, and dress, the peasants of all the foreign nations there represented were very much in advance of those of the English peasant. He thought the remarks made were generally too disparaging to French agriculture, inasmuch as he believed that there was no leading feature of improvement in this country which was not speedily taken up in France. In this respect, therefore, he could not agree with M. de la Tréhonnais. He believed the French government had done a vast amount of good for agriculture, and was still doing good, in the distribution over the country of superior breeds of stock for the purpose of propagation, in the establishment of agricultural exhibitions, and in the employment of agricultural machinery, and he had no doubt that country would in a short time reap the benefit of those measures.

The CHAIRMAN said, the time having arrived when the discussion—interesting as it was—must be brought to a close, it was now his pleasing duty to propose a vote of thanks to M. de la Tréhonnais for the very interesting paper he had laid before them. Whether they regarded the matter of the paper or the language in which it had been clothed, he was sure they would all agree that it was a most admirable production. However much they might differ from M. de la Tréhonnais as to the comparative merits of English and French agriculture, and the appearance of the English and French labourers—in spite of all those differences which naturally occurred when a body of men assembled to express their real opinions,—he was sure they would all agree that nothing more frank as an expression of opinion of the condition of his own country could have been presented by a foreign gentleman to an English audience. With regard to the existence of a class of peasant proprietors or peasant cultivators, that was a point of national importance quite equal to any question of fiscal regulations. Another subject to be regarded was the influence which a great manufacturing country exercised upon agriculture. What was it that had led to the agricultural pre-eminence of England? It was not the desire of men to spend money in the improvement of the land or the desire to cultivate land highly, but it was the

knowledge that the development of the productions of the land, where so large a proportion of the community were engaged in manufacturing pursuits would amply repay them for all their expenditure. He believed it was in this respect the agriculture of England and France differed, and notwithstanding what Mr. Hobbs had said as to farm cultivation, and in spite of all they saw on the borders of Flanders, which was as well cultivated as a country could be—yet any one who travelled through Brittany and Normandy as well as some other parts of France, would, in the present day, see that the cultivation was sadly inferior to that in this country. He had seen the plough drawn, not by one horse, or one bullock, but by the one cow that furnished the peasant with his only milk, and that was not an exceptional case; and, where that system prevailed, it was hopeless to look for agricultural excellence. He thought some of the remarks of M. de la Trehonnais had been a little misunderstood. He did not deny many merits on the part of the present ruler of France, but, on the contrary, took encouragement from his measures relative to agriculture. At the same time, M. de la Trehonnais was opposed to the system of centralization—that of the government taking on itself as large a share as possible of the operations of industry. It was to that cause that M. de la Trehonnais attributed a large portion of the defects at present attaching to the French agricultural system.

The vote of thanks having been passed,

M. DE LA TREHONNAIS acknowledged the compliment. He said he was aware that, in a paper confined to a few pages, there must be shortcomings in treating of so large a subject. He quite agreed with the Chairman in approving of the steps taken by the Emperor; the objections he had taken applied not to the Emperor, but to the system of Government. Allusion had been made to the marked physical improvement in the people of Paris. It was to be recollected that half the money for public works was expended in Paris alone, and that brought the artisans and mechanics into that city in great numbers, attracted by the higher rate of wages. But that was no index as to the condition of the people in the provinces. The same gentleman had spoken of the decrease of births as a subject not indicating the failing prosperity of a people. He (M. de la Trehonnais) begged to say that, not only had there been the diminution of births and increase of deaths which he had mentioned, but the average standard of life had also decreased. His friend, Mr. Hobbs, had eulogised the appearance of the French peasantry he saw at the Paris Agricultural Show. It might be that favourite servants were employed on that occasion, but they were not a fair sample of the labouring class in France. He had treated this subject not merely as an agriculturist, but as a political economist. Last summer he made the tour of the south of France, in order to enlighten himself on these subjects, and he had introduced his friend, Mr. Hobbs, to the farm of which he had spoken. He had stated in his paper that in the north of France and in Flanders the farming was as good as that in Great Britain, but those were isolated spots, and bore but a small proportion to the entire area of the cultivated lands of France.

The Secretary announced that on Wednesday evening next, the 24th inst., a paper by Mr. Thomas Allan, "On Electro-motive Machines," would be read.

On the table were exhibited two specimens of wood-carving, by Mr. William Bryer, an amateur.

SOUTH KENSINGTON MUSEUM.

During the week ending 13th March, 1858, the visitors have been as follows:—On Monday, Tuesday, and Satur-

day, free days, 2,894; on Monday and Tuesday, free evenings, 4,700. On the three Students' days (admission to the public 6d.), 770; one Students' evening, Wednesday, 306. Total 8,670.

Colonial Correspondence.

ON THE DESICCATION OF FUEL IN THE MANUFACTURE OF SUGAR.

SIR,—I beg leave to introduce through you, to the consideration of the Society of Arts, a few remarks on a subject of some importance to the tropical manufacture of sugar; I do not claim for them the same meed of approval with which the Society has already honoured some of my papers on kindred subjects, because they have not as yet been reduced to practice, still the data on which they are founded have been so well established, the inferences are apparently so plain, and the interests at stake of such serious gravity, that I am anxious the arrangements proposed should be submitted to a Committee of the Society, and, if considered practicable, either sanctioned by its approval or modified in such a manner as may subserve the interests of the planter.

The desiccation of the crushed cane is in itself a matter of serious moment, in whatever light it may be viewed, whether as regards the loss and inconvenience attendant on its deficiency as fuel or the anxiety and risk of storing it when abundant; its woody portion may be assumed as fully equal in weight to the crop of sugar shipped, say 300,000 tons, and as of this at least one quarter should always be on hand in the shape of dry fuel, ready stored for use, it may be easily supposed how its presence increases the anxiety of the sugar manufacturer, during the dry and windy months, when even the un-reaped canes resemble tinder.

With a view of removing risk and increasing the supply of fuel of a better quality at a lower cost, I venture to submit as follows:—

It is well known to the practical planter, that after the juice has been expressed from the cane by the mill action, the crushed stem or megass, as it is locally styled, is transported, either by an endless web or otherwise, to a covered enclosure, megass-house, or logie, where it is carefully packed and stored, till dry enough to serve as fuel in evaporating the cane juice.

The vessels in which this evaporation is conducted are ranged on a line, for the most part extending variously from 40 to 60 feet in length, and it is found in practice that no fuel can conveniently replace the dried stem or megass, as it is not only produced on the spot, but its long lambent flame envelopes and plays round the evaporators more efficiently than that of any substitute; consequently its preservation is a matter of paramount importance to the planter; and as the quality of the sugar, *ceteris paribus*, depends much on its more or less perfect desiccation, he takes care to provide, so far as his means allow, ample accommodation for its storage. Accordingly, on large estates, the megass-house or logie costs occasionally as much as £1,000 or £1,500 sterling.

It is the pride and care of the planter that, at the close of the crop, his megass houses should be sufficiently stored with fuel to carry him through, at least, six weeks of the ensuing crop; this is the case on most well-conducted estates, but the supply of fuel, although desirable, and, indeed, indispensable, is a constant source of anxiety to the proprietor, and requires incessant vigilance to guard against careless or wilful incendiarism. Once on fire, the burning mass, perhaps some hundred feet in length, endangers or destroys, not only the neighbouring buildings, but, frequently, the growing canes for miles around. Nothing equals the horror of these conflagrations, except, perhaps, the desolation they leave behind. The fuel is also lost at the moment it becomes indispensable, because

when the fire has passed through standing canes, it is necessary to reap them immediately, or the sugar which they would have otherwise furnished, is lost from the want of wherewithal to evaporate. No money payments can compensate for these losses, and, although the buildings may have been insured, the megass is not, and the immediate loss is aggravated by all the evils attendant on damp fuel, bad sugar, late hours, and discontented labourers.

If such accidents were inevitably connected with the manufacture of sugar, the planter might fold his hands with resignation when they occur; but they are not; and if you will favour me yet a little further with your attention, I shall, I hope, make it clear that it becomes his interest to obviate them as quickly as possible.

In proposing a remedy for such serious evils, it will be necessary, in the first place, to glance briefly at the composition of the sugar cane, and then to apply the data thus obtained to elucidate the desired practical result.

The sugar cane is generally considered as composed of 90 per cent. of juice, and 10 per cent. of woody fibre; this statement is not strictly correct, as it applies only to the merythyllis or internodular portions; the nodes themselves contain at least 17 per cent. of woody fibre, and, indeed, the whole cane, after maturity, very frequently becomes gradually dried up to perfect desiccation: therefore the proportion of fuel in the pressed cane must vary somewhat with the nature of the cane itself. The received opinion, however, that the sugar cane yields 10 per cent. of ligneous matter will form the basis of the present remarks, and, therefore, any variation in the dryness of the pressed cane will be considered as dependent on the varying power of the mills employed.

Let it be assumed, then, that the average quantity of juice expressed by cane mills is 65 per cent., (some mills, few in number, express more, but the average is certainly considerably lower,) then the refuse carried from the mill to the megass house contains not only 10 per cent. of lignine or woody fibre, but 25 per cent. of juice; what, then, becomes of this 25 per cent. of juice thus stored in the megass house or logie? Does it increase the amount of fuel in the crushed stem? Certainly not, for the sugar and water in the cane juice ferment and turn into acetic acid, which not only is in itself incombustible, but prevents combustion in other substances, and till it be fairly dried out the crushed stem is unfit for fuel, this process of drying requires months of storage, and even then is imperfect.

But again, it is found on the other hand, that when the megass, on leaving the mill, is desiccated, by being torn into shreds and exposed to the full ardour of the sun's rays, as is occasionally practised in the months of March and April, when there is any superfluity of labour, it may be used as fuel in the course of a few hours, and its superiority is evident to the most careless observer. Whence, then, this superiority to the ordinary fuel, which has been stored for months under cover? It is clearly due to the proportion of sugar contained in the crushed stem, which, instead of being allowed to ferment, has been converted by the desiccating action of the sun into a dried fuel of most unequivocal power. What has hitherto been exceptional, I would now propose as the rule, employing, instead of the sun's rays, some steadier and more manageable agent. It is not, perhaps, the best use to which the above-mentioned portion of sugar might be turned, but as in the present mode of manufacture its loss may be looked on as certain, the next best thing will be to utilise it on the acknowledged principle that nothing pays so well as refuse turned to profit. What, then, is the real value of this refuse, hitherto worse than thrown away? Is it sufficiently valuable to warrant the planter's incurring any expense in utilising, and if so, what will be his best plan to obtain the end in view?

It has been stated that 25 per cent. is the average amount of cane juice thus consigned to the megass

house in the interstices of the cane stems, but cane juice from a matured plant contains 20 per cent. of crystallisable sugar—(to avoid discussion this per-centage is given as purely approximative—it varies, not only in the same colony, but often in the same field)—therefore, the quantity of sugar actually lost is equal to one-fourth of the whole sugar contained in ripe canes, and represents in its present forlorn state 5 per cent. of good fuel, which by simple precautions might be added to the 10 per cent. of woody fibre already known to exist in the crushed stems or megass. In other words, the quantity of available fuel for evaporating cane juice, or raising steam to crush the canes, might be increased 50 per cent. If the proportions given above be correct, and of that there can be little doubt, it follows, that even in an economical point of view, it would pay to dry the megass as it leaves the mill.

It should ever be borne in mind, while considering this matter, that the desideratum after all, is not so much preparing fuel, as getting rid of the megass houses, whose existence on every estate is a constant source of uneasiness and danger.

To attain this end, there will be no occasion to purchase any extra amount of fuel, if advantage be taken of the waste heat that at present escapes by the chimney. It is not many years since this hitherto lost heat has been applied to raise steam for the crushing power, from boilers hung on the flues beyond the coppers, between them and the chimney stalk. For this purpose the heat formerly wasted has been amply sufficient, and as the draught still enters the chimney at a temperature over 500° Fahrenheit, the remaining heat will, it is assumed, be capable of removing 16 per cent. of the 20 per cent. of moisture remaining in the crushed cane, and thus turning it at once into an available fuel, in other words, with 10lbs. of fuel to evaporate 65lbs. of water. If this be practicable under existing circumstances, it must, *a fortiori*, be more easily accomplished when the combustible has been increased by the 5lbs. additional of sugar which it has been shown the crushed cane stems contained when they left the mill.

It has been already stated that the stems of the canes on leaving the mill are carried continuously, on an endless web, to the megass house, or logie, there to be stored for future use. This endless web it is proposed still to retain, but to employ it in an altered direction, viz., from the mill to the stoke-hole of the furnace, enclosed in a low archway, constructed of whatever may be the most inexpensive materials attainable, such as the walls "en pisé," and the roof of sheet iron. Against the damp megass, as it advances at slow mill speed along the interior of this covered way, should be directed a current of heated air, drawn from the chimney, sufficient to lick up and carry to a suitable exit any amount of moisture it may encounter. The volume of heated air required for this purpose can only be ascertained experimentally, as considerable allowance must be made for the manner in which much of the moisture is retained among the interstices of the woody fibre, and the extent to which the latter has been laminated. In some powerful modern mills, the megass is turned out something like a web of cloth or paper, and might be as easily dried. The question of details will probably offer no insuperable difficulties to those accustomed to the practical management of heated air currents; it will therefore be unnecessary to offer here any opinion as to whether the air should be driven through the asphalt by a fanner, or taken heated from the end of the flue; in either case it would, if of efficient action, probably do away with the necessity of erecting, for the sake of draught, high chimnies in colonies where earthquakes occasionally happen.

I am, &c.,

HY. MITCHELL, M.D., Ph.D.

Trinidad, Feb. 22nd, 1858.

Home Correspondence.

MR. ASHWORTH'S PAPER ON COTTON.

SIR,—I did not leave the meeting of the Society of Arts, on Wednesday evening last, until the chairman, owing to the lateness of the hour, had declined to comment upon Mr. Ashworth's paper, or upon the subsequent discussion. I inferred, therefore, that the business of the evening had terminated, otherwise I should have been present, and have responded to the call of some members to reply to two questions proposed in Mr. Ashworth's closing remarks. The two questions were—"What number of Europeans have availed themselves of the Government rules to secure for themselves land in India in perpetuity;" and "What is the amount of the exports and imports from and to India?" Both these questions were intended, as Mr. Ashworth hoped, to weaken my statements; but in my absence he answered them himself, and proved the vagueness of the assumptions with respect to Indian facts which I had lamented in the discussion. He assumed that there were only from 300 to 400 European settlers in all India, but he might just as well have assumed any other number, as there are not any official returns on the subject. Mr. Ashworth inferred either that land was not obtainable, or that it was not worth getting; in either case forgetting that he had charged the Indian Government with refusing to grant land in perpetuity, and consequently Europeans could not become owners of the soil, a statement which I had proved unfounded in fact, by citing the Government rules for granting land. Mr. Ashworth answered his own question about exports from India, by "judging" them to be about twelve millions sterling, and added, "Did this indicate prosperity?" My reply to Mr. Ashworth's "judging" is, that the exports from India in 1834-5 were £7,398,420, and in 1855-6 they were £23,089,268, being an increase of 188 per cent. The imports in 1834-5 were £4,261,106, and in 1855-6 they were £13,947,667, an increase of 237 per cent., but leaving a balance of trade in favour of India in the first year of nearly four millions sterling, and in the last year of more than nine millions, which balance was paid in silver, and did not go out of India again; and Mr. Ashworth stated that in the last 27 years these payments had amounted to 150 millions sterling, and yet, in the same breath, he asks "does this indicate prosperity?" The fact is, the great balance of trade in favour of India is greatly owing to the manufacturers of Great Britain not adapting their products to the wants of the people of India. A small supply of woollens suffices for a people who, for some months in the year, would be glad to get rid of their own skins, if they could cool themselves by so doing. They do not want our wines, spirits, and beer, our hardware, glass, stationery, books, apparel, &c., &c., but India might take articles of clothing, turbans, women's sashes, loin cloths, sheets, and other articles of personal clothing, provided the manufacturers of England would send them out to India of the inflexible usage form, in length, breadth, fineness, marginal borders, tuft or fringe ends, &c., &c.; but this common-sense plan the manufacturers have never yet adopted, and the result has been the enormous balance of trade in favour of India, to be paid annually in silver. To enable the manufacturers to judge for themselves of the kind of apparel in use amongst 181 millions of people in India, the Court of Directors of the East India Company have extended their Museum at the India House, to embrace, for exhibition and examination, all the textile fabrics of India; and these are open, upon application at the India House, to the inspection of all manufacturers; and it will be their own fault if they do not take advantage of the opportunities offered to them. The Court, also, have made a collection of all the raw products of India, par-

ticularly of the fibrous kind, in the hope that new articles of import may be found amongst them, to the advantage of commerce and the manufacturing interests.

The New Museum is open to the public every Friday.

I am, &c.,

W. H. SYKES.

London, 15th March, 1858.

PUDDLED STEEL.

SIR,—I have read with much interest Mr. Clay's paper on puddled steel, and I have recently taken the opportunity (while in Liverpool on other business) to go to Messrs. Naylor's works, and see specimens of the rails, plates, rivets, &c., made of that material.

In considering the application of such a material to engineering purposes, the first idea which suggests itself is its employment in the case of rails subjected to wearing.

Let us assume the duration of rails on lines of heavy traffic at 10 years; of medium traffic at 20 years; of light branch traffic at 30 years. Taking the average price of rails at £8 per ton, and the cost of manufacture at £3 per ton, and putting aside the question of compound interest, which is never practically used, we have for the annual cost of renewal on lines of

Heavy traffic 6s. per ton, per annum.
Medium traffic 3s. " "
Light traffic 2s. " "

If we suppose the steel rails did not wear at all, then, taking money at 5 per cent., this commercial value, above that of common rails, would be on lines of

	s.	£.
Heavy traffic.....	6 × 20 = 6	per ton.
Medium traffic.....	3 × 20 = 3	"
Light traffic.....	2 × 20 = 2	"

And taking the cost of common rails at £8 per ton, the relative commercial value of rails, which would last for ever, would be in lines of

	£	£	£
Heavy traffic.....	8 + 6 = 14	per ton.	
Medium traffic.....	8 + 3 = 11	"	
Light traffic.....	8 + 2 = 10	"	

But steel rails, though capable of great duration, will not last for ever; and, when worn out, are more expensive than iron to re-manufacture. Their price must, therefore be less than £14 per ton, to render their adoption advantageous even on lines of heavy traffic, and they must be produced at a still lower price to render them generally preferable to a well-made iron rail.

In the view of the cost above given nothing is allowed for the labour of taking out old rails and putting in the new, but the introduction of this item would affect the result very little.

In the case of rails for points and crossings the value of increased durability is much more important. Here, in addition to the cost of the rail and its re-manufacture, there are the maker's charges for cutting, bending, planing, &c., which amount to about £4 per ton. The duration of the best iron point and crossing rails in situations of large traffic is frequently not more than six months, and, in particular situations, even less than that.

With iron rails, used in points and crossings, therefore, there is an annual cost in renewal equal to $(8 + 4) 2 = £14$ per ton per annum. If the steel rails cost £15 per ton, and the manufacture into points and crossings £10 per ton, including cutting and planing, &c., and the duration, in a like situation, is four times that of common rails—then we have for the annual expense, including interest of money on the first cost:—for common point and crossing rails £14 8s. per ton per annum; steel rails £5 16s. per ton per annum.

Another application of this new material is for engineering structures, where strength is the object sought.

and for these purposes advantages of a very striking nature present themselves.

The steel produced by this process is stated to possess three times the tensile resistance of wrought-iron, and if its resistance to compression is in a like ratio, the results which arise are as follows:—

If w , l , d , and a , represent the weight, length, depth, and sectional area of a girder of iron $\frac{wl}{a^2d} = c$, a constant for similar forms of girder. If the girder is so constructed that equal portions of its length represent equal weights, and a load be equally distributed $= nl$, then, $\frac{(w + nl)l}{a^2d} = c$, a constant for similar forms of girder.

In like manner if w' , l' , d' , a' , represent the weight, length, depth, and sectional area of a steel girder, $\frac{(w' + nl')l'}{a'^2d'} = c'$, the constant for steel in similar girders. But as steel is three times the strength of iron, while the specific gravities are nearly the same, we have for equal strengths $\frac{3(w + nl)l}{da} = \frac{(w' + nl')l'}{d'a'}$. And

in the case where the length and depth of the steel girders are the same as those of the iron, the weight of the steel girders would be $w' = \frac{wnl}{2w + 3nl}$.

Let us apply this to the case of the Menai tube. The weight of each of the principal tubes is 1,553 tons, the length is 460 feet, and the maximum load equals 1 ton per foot, then, $w' = \frac{1553 \times 460}{2 \times 1553 + 3 \times 460} = 160$ tons nearly. Thus a girder of steel, of like dimensions as wrought iron, excepting in the thickness of the plates, weighing 160 tons, would possess the same strength as the Menai tube in wrought iron, which weighs 1,553 tons. Some modifications in the details of construction would be required, especially to resist buckling at the top; but the broad feature of the result is as above stated.

Considering the difference in the expenses of the apparatus for floating and lifting the smaller weight, as compared with the larger, and the difference in the requisite strength of the piers, the introduction of wrought steel in girders of large dimensions is fraught with the most important results.

In making this statement it is, however, on the assumption that the compressive resistance bears the same proportion to the tensile as in wrought iron, and that the actual amounts of extension and compression within the limits of elasticity are not such as to cause undue deflection.

A carefully-conducted series of experiments should be made to ascertain the following properties of puddled steel in addition to the tensile strength, namely,—

- The ultimate compressive strength.
- The limits of elasticity for compression.
- The limits of elasticity for extension.
- The actual amount of extension.
- The actual amount of compression.
- The resistance to buckling.

Should these several properties be found, as is indeed probable, to bear a similar ratio to the tensile resistance as in wrought iron, the employment of wrought steel for large engineering structures (such as are now demanded for crossing some of the large rivers in India and Russia) promises to form an era in engineering quite as important as that of late years arising from the introduction of wrought iron.

I am, &c.,

W. H. BARLOW.

19, Great George-street, Westminster, S.W., March 17.

THE ECLIPSE OF THE SUN.

SIR,—The following observations may interest your readers. They were noted down at the time, and were

made on high ground, about 4 miles north of Tonbridge. I am, &c., H.

March 15, 1858.—Half-past 9 a.m.; wind nearly due north. One thermometer placed in the sun, aspect due south. A second in the shade, with a northerly aspect, and both exposed to the wind, at 2 ft. from the ground.

	Thermometer in Sun.	Do. in Shade.
9.30	{ Sun clear and shining brightly. }	75° 43°
10.30		71° 49°
11.0		69° 50°
11.7	Clouds.....	65° —
11.15	Clouds.....	62½° —
11.30	Clear, light clouds	75° 49°
11.35		75° —
11.45		71½° 49°
11.55		72½° —
12.0		69½° 48½

Sun partially obscured, but bright occasionally. Birds singing as in the early morning, wind moderated.

12.15 60.5° 46.0
Birds singing; sheep feeding as usual.

12.30 Wind for a few minutes apparently gone; but a fresh breeze soon arose, preceded by a gust, as in a storm; Sun quite obscured. Thermometer, 55.5° in sun, 48° in shade; birds still singing as before, sheep grazing. Lower wind, W.N.W., upper current, N.

12.45 Darkness, that of a thunder-storm; birds continue singing, and sheep moving and grazing as usual. Wind N., Thermometer 53.5° in sun, 47° in shade.

12.55 52.5° 45.5°
Deficiency of light very sensible, but not so great as frequently occurs during a heavy storm—birds singing and sheep grazing as before.

1 p.m. Sun still invisible; there was no unnatural colour in the atmosphere; the darkness was not equal to that which frequently occurs during heavy storms.

1.15 The sun was visible again, but I was unable to watch the increasing temperature.

The difference of temperature due to the Eclipse, was, in the shade, 4.5°, from 50 to 45.5. In the sun, from 62.5°; the temperature at 11.15, when the sun had been obscured more or less by light clouds for three-quarters of an hour, to 52.5° or 10°.

The clouds not being so dense from 10.30 to 11.15, as from 11.30 to 1 p.m., it is hardly correct to attribute the 10° entirely to the Eclipse.

Proceedings of Institutions.

LAWNS.—The report of the Mechanics' Institution for the past year, shows that the present number of members is 362; the increase during the year having been thirty-eight. The number of books (exclusive of those from Mudie's) issued from the library was 5,192. Seventeen lectures were delivered during the year. The soirée held on the 26th and 27th of February last was attended by 1,403 persons; the net proceeds being £21 0s. 6d. This has been devoted to the furnishing of the Reading-room, and the purchase of a microscope, the excess of cost of the microscope, &c., having been defrayed by voluntary contributions. The number of vols. added to the library during the year was 160. Several vols. have been replaced, and about 140 rebound. The vocal music class has continued its weekly meetings through the whole year, and the elementary class, with the exception of the summer quarter, its bi-weekly meeting.

MEETINGS FOR THE ENSUING WEEK.

- Mon.** Royal Inst., 3. Prof. Huxley, "On Biology."
Architects, 8. Mr. James Blake, "Descriptive particulars and critical remarks on the Remains of the Abbey of Kilmacul, Ireland."
Geographical, 84.
- Tues.** Royal Inst., 3. Prof. Huxley, "On Biology."
Civil Engineers, 3. Continued Discussion, "On Submerging and Repairing Submarine Telegraph Cables." And Mr. B. C. Despard, "On the Improvements of the River Lee Navigation; with remarks on Canals."
Med. and Chirurg., 84.
Zoological, 9.
United Service Inst., 84. Dr. Guy, "On the Report of the Commissioners appointed to inquire into the regulations affecting the Sanitary Condition of the Army, and especially the want of space."
Wed. Royal Soc. Lit., 44.
Meteorological, 7. I. Dr. Tripe, "Observations on the Meteorology and Mortality of London in 1857." II. Mr. Bolton, F.R.G.S., "On the History of the Meteoric Iron of the Desert of Atacama." III. Mr. Glaisher, "Meteorological Observations, &c., during the Solar Eclipse."
Society of Arts, 8. Mr. Thos. Allan, "On Electro-motive Machines."
Geological, 8. I. Mr. G. W. Ormerod, F.G.S., "On the E-ak basins of Dartmoor." II. Mr. J. Lockenby, "On the Keltoways Rock of the Yorkshire Coast." III. Mr. J. C. Moore, F.R.S. and G.S., "On a Protusion of Silurian Rock north of Ayrshire."
Archæological Assn., 84.
- Thurs.** Royal Inst., 3. Prof. Tyndall, "On Heat."
Geological Museum, Jermyn-street, 3. Professor Owen, "On Palæozoic and Triassic Reptiles." (3rd Lecture).
Royal Society Club, 6.
Mammalian, 7.
Antiquaries, 8.
Royal, 84.
- Fri.** Geological Museum, Jermyn-street, 3. Professor Owen, "On Palæozoic and Triassic Reptiles." (4th Lecture).
United Service Inst., 3. Mr. J. Boncher, "On the Rise and Progress of the Risle Expansion System, including Remarks on the Risle Projectiles of various countries."
Royal Inst., 84. Rev. J. Barlow, "On the Mineral Candles and other products manufactured at Belmont."
Sat. Royal Inst., 3. Prof. Blixam, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Delivered on 23rd, 24th, 25th, and 26th February, 1858.*
- 1.** County Rates—Return.
2. Woods, Forests, and Land Revenues—Abstract Accounts.
3. Irish Reproductive Loan Fund—Account.
4. School Books (Ireland)—Return.
5. Sheriff Small Debt Courts (Scotland)—Return.
6. Court of Chancery—Return.
7. Divine Service (Army) Return.
8. Duchy of Cornwall—Account.
9. Poor Relief (Scotland)—Return (a corrected copy).
10. Bills—Grand Juries (Ireland).
11. Government of India.
12. Tenant's Compensation (Ireland).
13. General Board of Health (Skipton).
14. Foreign Refugees—Copy of Despatch from Her Majesty's Ambassador at Paris.
15. China—Correspondence with the Chinese High Commissioner Yeh.
Delivered on 27th February, and 1st March, 1858.
16. Select Committees—Return.
17. Police (Scotland)—Rules and Regulations.
18. Property Tax and Population, &c.—Return.
19. Committee of Selection—Second Report.
20. Poor Relief (Scotland)—12th Report of the Board of Supervision.
21. Second Session, 1857.
22. Emigration (Australian Colonies)—Return.
Delivered on 2nd, 4th, 6th, 8th, 10th, 11th, and 12th March, 1858.
23. Revenue Departments—Estimates.
24. Excise Officers and Surveyors, &c., of Taxes (Scotland) Treasury Minutes.
25. New Zealand—Copy of Despatch.
26. Corn, &c., (Ireland)—Return.
27. East India (Annexation of Oude)—Return.
28. Works and Public Buildings—Abstract Accounts.
29. Hops—Account.
30. Quarantine—Return.
31. Public Monies—Copy of Treasury Minute.
32. Hudson's Bay Company—Return.
33. Aggravated Assaults (Metropolis)—Return.
34. East India (Education)—Copies of Correspondence.
35. Poor Rates and Pauperism—Return (A.).

- 104.** Immigrants and Liberated Africans—Return.
109. Hampton Court Palace and Kew Gardens—Return.
111. Spirits (Scotland)—Returns.
108. Quit Rents (Ireland)—Return.
106. Registered Electors—Return.
112. Kensington Gore Estate—Return.
Colonel Robert Frith—Copies of Papers and Correspondence.
Station (Second), 1857.
306. East India (Cotton)—Return, Part 2, Madras.
331. Election Expenses—Abstract of Return.
Delivered on 13th and 15th March, 1858.
110. Exports and Imports—Accounts.
105. Bermuda—Return.
114. Committee of Selection—Third Report.
116. Army (Embodied Militia)—Supplementary Estimate.
124. General Committee of Elections—Mr. Speaker's Warrant.
113. Harbour, &c., Bills (Blyth Harbour and Dock; 1. Llanelli Harbour; 2. London Dock Company; 3. Trent Navigation; 4. Whitehaven Harbour; 6. Burghhead Harbour; 6. Tees Conservancy; 7. Fishguard Harbour Improvement; 8. Leith Railway and Lough Allen Pier; 9. Hesketh Marsh; 10. Yax Bridge; 11. Tyne Improvement; 12. Plymouth Great Western Docks; 13. Wexford Harbour Embankment)—Board of Trade Reports.
117. Railway and Canal Bills (1. Aylth Railway; 2. Caledonian Railway (Dalmeirck Branch); 3. Carron Railway; 4. Dundalk and Enniskillen Railway; 5. Ely Valley and Eden Valley Railway; 6. Liskeard and Looe Union Canal Company; 7. Midland Great Western Railway of Ireland; 8. North Yorkshire and Cleveland Railway; 9. Salisbury and Yeovil Railway; 10. Selkirk and Galashiels Railway; 11. South Devon and Tavistock Railway; 12. Lymington, Bigger, and Broughton Railway; 13. Vale of Towry Railway; 14. Worcester and Hereford Railway)—Board of Trade Reports.
East Indies (Mutinies)—Further Papers (No. 6).
Births, Baptisms, &c. (Non-parochial Registers or Records)—Report of Commissioners.
Delivered on 16th March, 1858.
80. East India (North-Western Provinces, &c.—Return (a corrected Copy).
26. Birth—Agricultural Statistics.
France—Correspondence respecting Foreign Refugees in England.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, March 12, 1858.]

- Dated 18th Feb., 1858.*
- 308.** W. H. Crispin, Marshgate-lane, Stratford—Imp. in the construction of bearings, beds, and sockets for axles, shafts, pivots, and other rotating parts of machinery.
310. G. Claridge, Pontypool Iron Works, and R. S. Roper, F.G.S., F.C.S., Ebbw Vale Iron Works, Monmouth—An improved mode of manufacturing coke.
312. J. Chadwick, Glasgow—Imp. in machinery or apparatus for engraving or producing printing surfaces.
314. F. Jones, Manchester—Certain imp. in machinery or apparatus for cutting 'plamaw,' or other fibrous substances employed in the manufacture of brushes, which said imp. are also applicable to other purposes of cutting.
Dated 19th Feb., 1858.
316. W. Riley, Liverpool—An improved method of raising and lifting water from the bilge or holds of ships and other vessels, and is a peculiar construction and arrangement for effecting the same.
318. J. Champion, Manchester—Imp. in spinning cotton, silk, flax, wool, and other fibrous materials.
320. E. Haws, Doncaster Iron Works, Yorkshire—Imp. in the manufacture of iron wheels.
322. I. Brown, Carlisle, and J. Brown, Notting Hill—Imp. in machinery or apparatus for reducing bones.
324. W. Skallitzky, Vienne—Imp. in the manufacture of socks and stockings.
Dated 22nd Feb., 1858.
326. W. E. Nethercliffe, Swansea—Imp. in the construction of parts of railway carriages.
330. H. Edwards, Bishopgate street—Imp. in stoppers for feeding bottles and other vessels.
332. T. Green, Leeds—Imp. in mowing machinery.
334. W. Greene, 21, Merlin's-place, Clerkenwell, and M. O. Greene, 19, Hatton garden—Imp. in joining soft metal pipes.
336. A. Myers, 12, Hutchison-street, Gravel-lane, Hounslow—Imp. in the manufacture of caps or coverings for the head.
340. W. Bette, Wharf-road, City-road—A new manufacture of glazed or enamelled paper.
Dated 22nd Feb., 1858.
342. John Davis, 11, Burlington-terrace, Queen's-road, Dalston—Imp. in cornets and other wind musical instruments.
344. W. Hall, Erith—Imp. apparatus for working railway breaks.
346. E. A. Brumman, 166, Fleet street—Imp. in machinery for effecting the amalgamation of precious metals. (A com.)
Dated 23rd Feb., 1858.
348. F. Puls, Haverstock-hill—The manufacture of certain hydrocarbons.
350. W. Johnston, Glasgow—Imp. in apparatus for regulating or controlling the flow or passage of fluids.

352. R. A. Brooman, 166, Fleet-street—Imp. in apparatus for separating substances of different specific gravities. (A. com.)
 354. E. Toynbee, London—Imp. in the manufacture of manure.
 356. J. Boydell, 66, Gloucester-crescent, Camden-town—Imp. in locomotive carriages.

Dated 24th Feb., 1886.

356. A. C. Hobbs, 76, Cheap-side, London—A domestic bell telegraph.
 360. E. Borlase, St. Just, near Penzance, Cornwall—Improved apparatus for separating metals and metallic ores from other mineral substances.
 362. J. Henderson, Glasgow—Imp. in shells or explosive projectiles.
 364. C. Kaye, Lockwood—Imp. in couplings for connecting and disconnecting wagons and other carriages on railways.
 366. A. V. Newton, 66, Chancery-lane—Certain improved means of relieving the slide valves of steam engines of unnecessary friction. (A. com.)
 368. A. V. Newton, 66, Chancery-lane—A mode of varying the length and reversing the direction of the throw of an eccentric, applicable to the reversing gear of locomotives and expansion gear of other steam engines, and to other purposes. (A. com.)
 372. A. Applegath, Darford, Kent—Imp. in printing machinery.

Dated 25th Feb., 1886.

373. W. Tatham, Rochdale—Imp. in machinery, or apparatus for lubricating the pistons, piston rods, cylinders, and other parts of steam or other engines, and which is applicable to other purposes where lubricating matter is required.
 374. J. Arnold, Newton Moor, near Hyde—Imp. in metallic pistons.
 376. J. B. Barnes, Summer lane, and J. Leach, Caroline-street, Birmingham—Certain improvements in apparatus for descending and ascending the shafts of mines or other deep pits, the descent and ascent of which imperils the lives of the miners or others employed therein.
 376. J. Templeman, Dunsfermline—Imp. in the manufacture or production of artificial fuel.
 377. W. Slater, and S. Smith, Bolton-le-Moors—Imp. in machinery to be used in turning and cutting metals.
 379. J. T. Pitman, 67, Gracechurch street—Imp. in hand lever self-inking printing presses, for printing cards, envelopes, bill-heads, and other articles. (A. com.)
 380. A. V. Newton, 66, Chancery-lane—Improved machinery for grinding and polishing glass, stone, metal, and other substances. (A. com.)
 381. L. P. Lambert-Alexandre, Paris—Imp. in apparatus and signals for preventing accidents on railways.

Dated 26th Feb., 1886.

382. J. Morison, sen., and J. Morison, jun., Paisley, Renfrew, N.B.—Imp. in Jacquard apparatus used in weaving.
 383. W. C. Smith, 31, Lincoln's Inn fields—Imp. in the manufacture of envelopes for letters and other purposes. (A. com.)
 384. W. Chadwick, Bury—Imp. in ventilators.
 385. H. Mackworth, Clifton—Imp. in the separation, raising, and lowering of coal and other minerals, and in cooking, and in apparatus connected therewith.

Dated 27th Feb., 1886.

387. S. Hogg, Nassau-street—Imp. in applying power in locomotion, by which a given force may, in its effect of overcoming resistance, be increased and multiplied.
 388. J. Knott, 63, Oakley-street, Lambeth—An improved feeding-bottle.
 389. J. T. Raymond and A. Lambert, Caledonian-road—Ornamenting textile fabrics.
 391. L. Galli, Milan, Italy—A process of superfinishing wood engraving, which he calls Galitotyp.
 392. W. Cave, Rathbone-place—Imp. in apparatus for propelling vessels, carriages, and machinery.
 393. M. Henry, 71, Fleet-street—Imp. in electro-magnetic motors. (A. com.)
 394. W. A. Gilbee, 4, South-street, Finsbury—An improved union joint for gas, water, and steam pipes, also applicable to the branch pipes of fire-engines. (A. com.)
 395. W. A. Gilbee, 4, South-street, Finsbury—Imp. in the branch pipes of fire-engines or pumps. (A. com.)
 396. W. Clark, 53, Chancery-lane—Imp. in preparing paper for, and in obtaining, photographic proofs or impressions. (A. com.)

Dated 1st March, 1886.

397. J. G. Newey and W. M. Newey, Birmingham—Imp. in fastenings, especially for or applicable to wearing apparel, and purposes where a spring connexion or adjustment is desirable, in arranging for sale and packing fastenings and ornaments, and in ornaments for personal wear.
 399. A. V. Schuttenbach, St. Petersburg—An improvement in treating fatty and oily matters.
 400. J. Hadfield, Guelmsford—Imp. in the manufacture of manure and other products, when treating sewage matters, and in the manufacture of colours.
 401. J. Kingford, Upper Marsh, Lambeth—Imp. in lamps.
 402. D. Greenley, Upper Cumming-street, Fentonville, and T. B. Daft, Bedford-street North, Liverpool—Imp. in machinery for boring for water, or for other purposes.
 403. H. M. Platt, New York—Imp. in ploughing and tilling land.
 404. W. E. Newton, 66, Chancery-lane—Improved machinery for removing burrs and other extraneous substances from wool or skins. (A. com.)

405. W. E. Newton, 66, Chancery-lane—Imp. in the treatment or preparation of maize or Indian corn, previous to grinding the same into flour. (A. com.)
 406. J. Billing, Abington-street—An improved throat and door for chimneys and flues.

Dated 2nd March, 1886.

407. J. Skelly, Kilecurrey, Ireland—Imp. in carriage springs.
 408. J. Bircumbshaw, Leaton, Nottingham—Imp. in machinery for dressing lace made of silk, cotton, or other material.
 409. R. A. Brooman, 166, Fleet-street—An apparatus for separating substances of different specific gravities, and for washing sands and earth. (A. com.)
 410. A. Ripley, 10, Alfred-place, Newington-nunnery, Southwark—Imp. in machinery for rolling and polishing leather, and tanned or untanned hides.
 411. J. H. Johnson, 47, Lincoln's Inn fields—Imp. in superheating or regenerating steam, and in the application of the same to steam engines. (A. com.)
 412. W. Hooper, Mitcham, Surrey—Imp. in the manufacture of buffer and other springs when vulcanized india rubber is used.
 413. A. V. Newton, 66, Chancery-lane—An imp. in the process of manufacturing soda and potash. (A. com.)
 414. W. B. Driggs, New York—Imp. in pianofortes. (A. com.)
Dated 3rd March, 1886.
 415. E. H. C. Monckton, Parthenon Club, Regent-street—Imp. in distilling and rectifying, and in the apparatus to be employed therein.
 417. P. J. Gautrot, Paris—Instantaneous tents, invented purposely for the use of public vehicles called omnibuses, but which can also be applied to any others, open vehicles, carts, or wagons, and travelling hawkers, at a very low cost; new system of shelter against the inclemency of the weather.
 419. B. Parker, Hammer-smith—The manufacture of materials for coating, cementing, bedding, and otherwise protecting bodies, and which are also applicable to the construction or formation of various articles.
 421. W. Soobie, Bow Common-lane, Mile end—Arranging the retorts, furnaces, flues, communications and connections, for the more economical manufacture of gas, and by which arrangement the generative heat may be obtained from either coal, coke, tar, or other similar combustible substances.
 423. W. H. Graveley, Upper East Smithfield—An apparatus for purifying sea and other mineral waters, and rendering them fit to drink.
 425. G. A. Biddell, Ipswich—Imp. in machines for cutting vegetable and other substances.

INVENTIONS WITH COMPLETE SPECIFICATION FILED.

422. G. J. Parson, Adelphi-terrace, Strand, and T. Pilgrim, Bow—Imp. in the mode of raising the temperature of steam generated in steam boilers, and using the same for working steam engines.—3rd March, 1886.
 436. C. Eynard, Walsall—An improvement or improvements in certain descriptions of buckles.—4th March, 1886.

WEEKLY LIST OF PATENTS SEALED.

March 12th.

2372. N. Fisher.
 2374. C. Watson.
 2376. J. Leeming.
 2379. W. Googoe.
 2381. T. Marsh.
 2387. R. Shiers.
 2388. J. Ashby.
 2390. T. Grahame.
 2391. R. Wicks.
 2399. A. Seward and C. Seward.
 2400. C. W. Lancaster.
 2402. J. H. Winder.
 2403. W. Middleton, junr., and T. T. Chellingsworth.
 2414. W. Smith.
 2417. J. M. Munro, junr.
 2420. C. Delevante.
 2446. G. Schaub.
 2467. V. Pén.
 2841. J. T. Way.
 2991. J. Fowler, junr., and W. Worby.
 3131. F. Taylor.
 3176. J. Cottrill.
 3177. I. Holden.

3182. V. Monrot.

32. S. Lees.
 62. J. Broadley.
 70. M. A. F. Meunier.

March 16th.

3411. I. L. Pulvermacher.
 3421. S. Whitehead.
 3423. S. Faulkner.
 3426. T. Wilson.
 2436. D. Lichtenstadt.
 2437. W. H. James.
 2441. H. Ormon.
 2443. M. Theller.
 2468. G. Reante.
 2472. T. Saunders.
 2499. J. H. Johnson.
 2512. J. Paisley and G. Berman.
 2530. G. W. Shibles.
 2535. R. Green.
 2541. W. E. Newton.
 2552. J. Combe.
 2630. W. Macnab.
 3172. J. Boydell.
 3181. A. Parkes.
 5. A. Parkes and H. Parkes.

PATENTS ON WHICH THE STAMP DUTY OF 25s HAS BEEN PAID.

March 8th.

534. S. C. Lister.
 539. S. C. Lister.

March 9th.

555. J. M. Napier.
 591. W. Hill.
 602. G. A. Barrett, W. Ezall, and C. J. Andrews.
 603. March 10th.
 576. W. Galloway and J. Galloway.
 766. R. W. Walthman.

March 11th.

571. J. Mariand.
 749. F. Joyce.

March 12th.

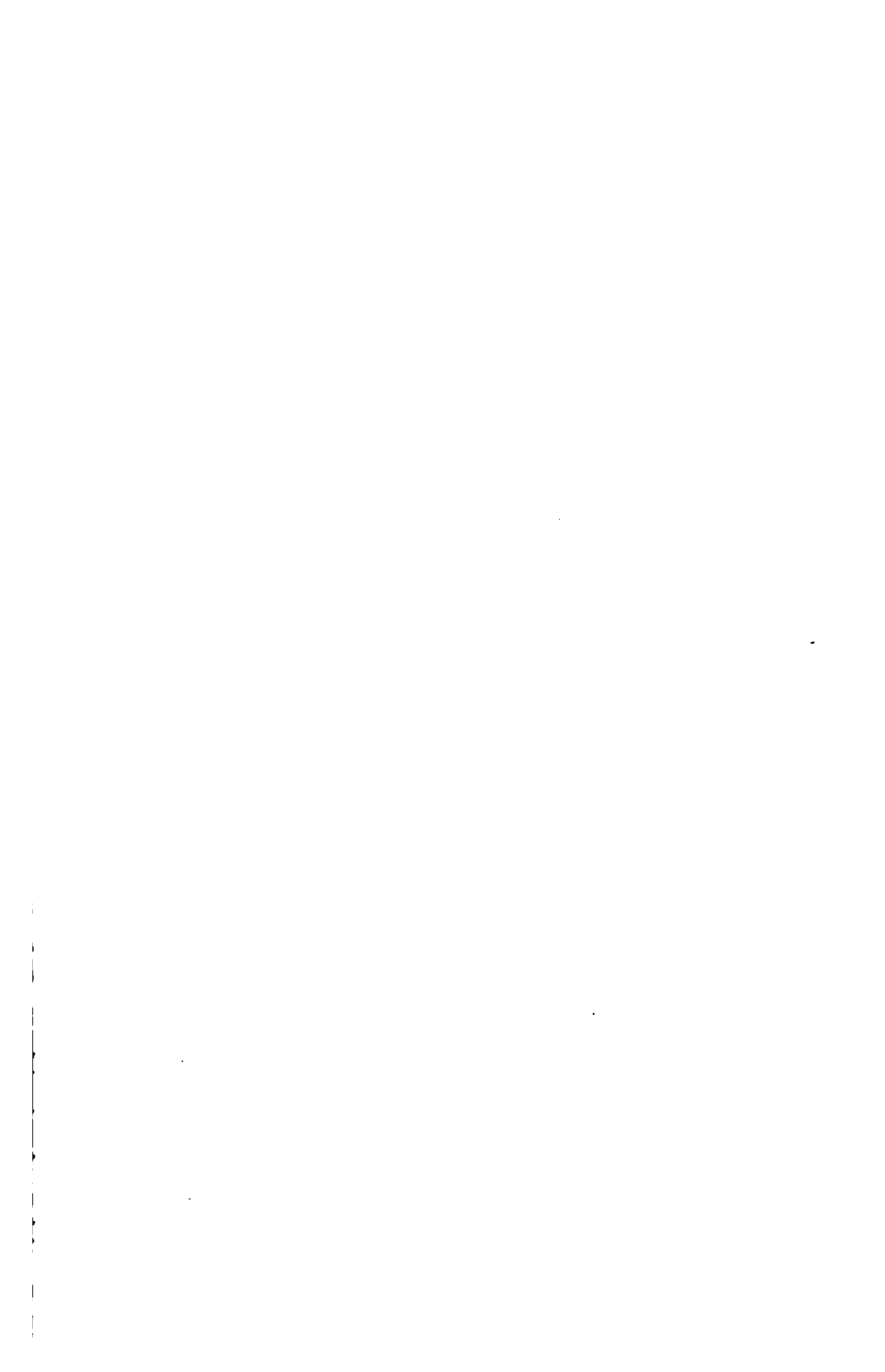
567. B. Goodfellow.
 574. E. J. Mitchell.

March 13th.

584. R. Neale.
 572. E. V. Gardner.
 585. E. M. Burt.
 1297. T. Whitehouse.

Royal
VA





of the Society of Arts.

DAY, MARCH 26, 1858.

CONVERSAZIONI.

Council have arranged for two Conversazioni for the present session; the first on the 24th April, at the Society's House, a card will be issued to each member; on Saturday, the 8th May, at the London Museum, the card for which a member and two friends, ladies or

DONATION PRIZE FUND FOR 1858.

Following is a list of Donations up to date:—

Ed., Member of Council.....	£ 5 5
.....	5 5
Ed., F.R.S., Auditor	10 10
Ed.	5 0
Ed.	5 5
Ed., Vice-Pres.	10 10
.....	10 10
Ed., C.B., Vice-Pres.	1 0
Ed., B.N.	£1 1
Ed., North Dilke, Vice-Pres. Chairman	10 10
Ed. (third donation)	10 10
Ed.	1 1
Ed., F. Eardley Wilmot, R.A.	5 0
.....	5 0
Ed., North, Member of Council	5 5
Ed., North, F.R.S., Treasurer (second)	10 10
.....	10 10
Ed., Haden (annual)	2 2
Ed., Ashworth	1 1
Ed., Gibson (annual)	2 2
Ed., Jones (annual)	1 1
Ed., Jones of Lansdowne, Vice-Pres.	20 0
Ed., Jones, F.R.S.	1 1
Ed., Jones of the Mint, Member of Council	10 10
Ed., North, M.P.	10 10
Ed., North, Phillips, Member of Council ...	5 5
Ed., North, Radford	1 1
Ed., North, Cliff, Hon. Local Sec. (annual)...	10 10
Ed., North, M.D.	1 0
Ed., North, Cooke, F.R.S., Vice-Pres.	10 10
Ed., North, Evelyn	1 0
Ed., North, G., Jun., Vice-Pres.	10 10
Ed., North, Jones Watson	1 1
Ed., North, Jones, F.R.S., Member of Council	10 10
Ed., North, (donation)	10 10

SOCIETIES OF ART AND SCIENCE.

Council have appointed the following Committee to consider and report on the practicability of establishing Galleries of Science in different parts of the metropolis, which shall be open in the evening.

Ed., C.B.
Ed., North Dilke (Chairman of the Council.)
Ed., Hawes.
Ed., Donald.
Ed., North, M.P.

REPORT OF THE ARTISTIC COPYRIGHT COMMITTEE TO THE COUNCIL.

Your Committee, appointed by your minute of the 2nd day of December, 1857, for inquiring into the subject of Copyright in Works of the Fine Arts, have examined the matters referred to them, and agreed to the following

REPORT.

At their first meeting, your Committee appointed Sir Charles Eastlake, President of the Royal Academy, their Chairman; John Lewis, Esq., (then President of the Society of Painters in Water Colours) Deputy Chairman; and D. Robertson Blaine, Esq., Barrister-at-law, Reporter.

Your Committee have held ten meetings, which on all occasions have been numerously attended.

For the purpose of clearly defining the objects of your Committee, they passed the following resolutions on the 31st day of December, which were inserted in the Journal of your Society, and otherwise extensively circulated:—

“Resolved—That the inquiries of this Committee be directed

1. To ascertain the existing laws of British Artistic Copyright, and the chief defects of those laws.
2. How those defects affect the interests of producers of works of Art.
3. How they affect the interests of purchasers of works of Modern Art.
4. How they affect the interests of the public and the promotion of the Fine Arts.
5. How they affect the subjects of those foreign States with whom Her Majesty has entered into International Conventions; and what the laws of those States are as affecting Artistic Copyright.
6. To obtain instances of fraudulent or wrongful acts relating to works of Modern Art.
7. And lastly, to suggest such remedies as appear best calculated to amend the defects of our Artistic Copyright laws.”

The Committee also passed a resolution, requesting Mr. Robertson Blaine to report to them upon the existing English common and statute-law relating to Artistic Copyright. In consequence of the interest mutually acquired by British artists and aliens under the various International Copyright Conventions, entered into by Her Majesty with Prussia, France, and other foreign states—and the Orders in Council founded on those Conventions—the Committee considered it advisable that the Report to be made to them should contain some notice of the Artistic Copyright Laws of these States. The document prepared by Mr. Blaine, in pursuance of the resolution above referred to, having been presented to your Committee, it was then, with your sanction, also printed and extensively circulated, in order that the public might be informed of the defective state of our laws of Artistic Copyright. Your Committee have likewise annexed it to this their Report, as it includes and answers the first five of the above resolutions of your Committee. It is marked (A) in the Appendix.

With respect to the sixth Resolution, passed by your Committee on the 31st December, namely, “To obtain instances of fraudulent or wrongful acts relating to works of modern Art,” the Chairman of your Committee issued a circular letter, accompanied by a set of questions, Copies of which are appended to this Report, and marked (B) and (C) in the Appendix.

A very large number of answers were received in reply from many of the most distinguished artists, and other persons connected with the Fine Arts.

These answers afford most ample and conclusive evidence of the defective state of the laws of British

Artistic Copyright, and of the wrongful and fraudulent acts which are extensively and constantly committed with impunity, to the serious injury of artists and the purchasers of works of Art, as well as to the demoralization of the parties to such acts; but the communications made having been received confidentially, your Committee are prevented from publishing them.

Your Committee thereupon proceeded to pass the following Resolutions:—

1. That the existing laws of British Artistic Copyright are exceedingly defective and unjust. The chief defects are:—

1. That they afford the producers of works of Art no sufficient protection against the piracy of their productions.
2. That the purchasers of such productions are equally unprotected, and their property therein liable to invasion and injury.
3. That in consequence of this defective state of our laws of Artistic Copyright, direct encouragement is given to the extensive manufacture, which is carried on, of spurious copies of works of Art, which copies are extensively sold as originals, to the serious injury of the fame of the authors of such original works, the pecuniary loss of the purchasers of the spurious copies, and the demoralisation of the young or needy artists employed to manufacture such copies.
4. That our Artistic Copyright laws are unjust in their operation upon the Subjects of those foreign States who have entered into International Copyright Conventions with Her Majesty, inasmuch as such treaties are based upon the principle of reciprocity, and that while under those treaties the works of British artists first published in the British dominions are protected from piracy within the territory of the foreign State named in any such treaty, no similar protection is afforded in the British territories in respect of the works by artists of such foreign States.

II. That the interest of art and artists, as well as of the public, require the laws of British Artistic Copyright should be amended.

With reference to the last resolution of the 31st December, namely, "to suggest such remedies as appear best calculated to amend the defects of our Artistic Copyright Laws," your Committee, after numerous meetings and lengthened discussions, passed the following resolutions:—

That any Bill which may be prepared for the amendment of the laws of British Artistic Copyright should, in the opinion of this Committee, include the following clauses:—

1. The repeal of all the existing Acts relating to Artistic Copyright.
2. That the amending Act should extend to all parts of the British dominions.
3. That it should protect all works of Art by British authors, although executed or first published in any Foreign State.
4. That it should likewise protect all works of Art by *alien* authors (whether friends or enemies), although executed or first published in any Foreign State.

On arriving at this stage of their proceedings, your Committee decided upon postponing the further consideration of clauses for any Bill which may be prepared, and passed the following resolutions:—

1. The chief object it is desired to effect by the Amending Act, is to secure a Copyright for the

Author's life, and 30 years after, for such of the designs of an artist as he may himself have conceived, and as have been produced by his own hands, or by those of his assistants, and as he may himself have signed or marked, so as to claim Copyright for.

[These would be works of which the artist's own brain may be considered as the inventor and primary source, and would include all, however first embodied; and whether they profess to be portraits of men or things, or the products of imagination: and will apply especially to the works of
Painters and Designers,
Sculptors and Die Engravers,
Architects.]

2. The next object desired is, to secure protection for a like period of works of Art of a more imitative character, and not necessarily embodying original design, and to prevent these being used by strangers as a means or basis for reproducing others like them, to be sold in competition with themselves.

[This will include the case of the piratical user by one engraver or photographer of the work of his rival, in order to make repetitions from, while it leaves the original design or other source open to both parties, and will apply principally to

Engravers,
Photographers,
Plaster, &c., cast makers.

E.g.—Mr. Doo may choose to engrave an old National Gallery picture. Any other engraver may go to the picture and engrave another, but he has no right to use Mr. Doo's engraving to produce it from. So with a photographer who may travel to the Holy Land, and bring back photographs. Others ought not to use his, though they may also go to the Holy Land and get the same subject there.]

3. The third object desired is, to secure, for a like period, Engravers against plates which have been engraved by them, and bear their name, being touched over and altered by others, and then re-issued with the engraver's name still on them.
4. It is desired to extend (as was done for authors in 1842) the Copyright above contemplated, to all the past works of living artists which they have still in their possession; and also to those which they have parted with, provided they obtain the consent of the proprietor, and affix their name or monogram.

QUALIFICATION ON THE COPYRIGHT ABOVE PROPOSED.

1. As to architectural plans, models, &c.; only the use of the originals to be secured; but not to prevent new drawings, &c., being taken from executed buildings or works.
2. As to sculpture; only to prevent the publishing of copies, casts, engravings, &c., purporting to represent or reproduce the original design as the sole or chief end of the publication.

[*E.g.*—No stranger ought to engrave one of the statues at the entrance of the House of Lords as a work per se. While a picture of the whole scene, including the set of statues as incidents, would be within the rule known as to Copyright books, permitting legitimate extracts not being competitions with the original work or design.]

AS TO PROTECTING THE PUBLIC AGAINST FRAUDS.

The object is to guard the public against—

1. The making, or causing to be made, copies of works of Art, for the fraudulent purpose of selling or exchanging such copies as originals.
2. The fraudulent sale or exchange of copies as originals.

3. The fraudulent use of artists' or engravers' names, as to works which are not theirs.
4. The passing off fraudulently re-touched engravings as first proofs, &c., or as the works of the original engraver, though re-touched by other hands.

The mode of effecting this is proposed to be by making—

1. The copying, or knowingly uttering of the copy of artists' names or monograms a felony.
2. The other offences a misdemeanour.

AS TO LEGAL PROCEDURE TO ENFORCE COPYRIGHTS.

In addition to such remedies as law would give—

1. Penalties, not less than £5, and not exceeding double the value of the design or work pirated, to be recoverable for each offence, in manner provided in Ornamental Designs Copyright Act, 1842.
2. Power to Courts and Justices to order the delivery up or the cancelling of pirated articles.

Very considerable discussion took place upon the point whether the registration of works of Art ought or ought not to be made a condition precedent to the acquisition of any Copyright therein, and your Committee ultimately resolved that no such registration ought to be required, and thereupon passed the following resolutions:—

1. That having regard to the number of works of Art which are daily produced; to their nature; and to the circumstances under which they are produced, it is the opinion of this Committee that a complete Copyright Registration, by all British and Foreign artists, so arranged as to show, through Drawings, Models, or the like, all the matter for which Copyright is proposed to be conferred, would be wholly impossible. That its attainment is not desired by artists or publishers, and that no advantage would arise from it to the public.
2. That to make Registration a condition precedent to the acquisition of Artistic Copyright, would render it necessary that every work tendered to exhibition, although refused, and every sketch in the folio of the artist, should previously have been sent to London and registered, and so would be to place artists under a condition not imposed upon authors, and by the difficulty of the task imposed and the expense involved, and by the unnecessary centralization of the office, would debar the bulk of the body from the benefit of the proposed law. It would also render it impossible to grant a Copyright to the past works of living artists.
3. That to make Registration a condition precedent, would further be to encourage the commission of piracies on artists and frauds on the public, because the parties dealing in such piracies and frauds would be always on the alert to avail themselves of every slip in the registry, just as has always been the case with respect to patents.
4. That, in considering this subject, it should be borne in view that artistic piracies are, in their nature, more injurious to the public than those committed on authors or ornamental designers; because, in the latter cases, the purchaser is as well-served and contented with the pirated work as he would have been with an original; whereas, upon infringements of Artistic Copyright, the purchaser of the pirated copy is often much more injured than the artist. The case most analogous to the one under the consideration of the Committee, is that of pirated trade marks, as to which no registration is required by law, and on which, with reference to a

foreign trade mark pirated here, his honour, Vice Chancellor Wood, has lately used the following most apposite words,—“I cannot conceive anything short of indictable offences more discreditable than such proceedings.” (3 Kay and J. 483.)

5. In considering the subject of imposing registration as a condition precedent to title, it should further be borne in mind that such a law makes title always turn on points wholly immaterial to the justice of the case; and that the experience of the mischiefs arising from such a registry, 1st as to shareholders or joint stock Companies, and 2nd and 3rd as to ships and patent rights, has lately led the Legislature almost entirely to abolish the 1st, and greatly to modify the 2nd and 3rd.
6. That the position in life and want of business training of artists, the pecuniary difficulties which so many of them have to contend with, the remote places in which their studies are constantly made and their works often produced, the frequent changes made in them, often long after their first publication and sale, should be had in view before a condition is imposed so onerous to them in its performance and so sure to be neglected, and would make it necessary that they should, as authors now do, only connect themselves with the purchaser and public through publishers or dealers, a state of things as regards the influence of art to be deprecated.
7. If, notwithstanding these considerations, doubts should still be entertained by the Legislature as to the propriety of imposing some registration, then this Committee submits that such imposition should be postponed until the proposed new law has been at work long enough for experience to develop those points (if any such there should have to be) to which such a registration should be directed.

Charles L. Eastlake, P.R.A.
(Chairman.)

John Lewis (Deputy Chairman.)

*D. Robertson Blaine (Reporter), *subject to the protest below.*

Joseph Arden.

Francis Barlow.

*Jacob Bell, F.L.S.

*John Bell.

William John Broderip, F.R.S.

*F. S. Cary.

*A. E. Chalon, R.A.

*A. Claudet, F.R.S.

C. R. Cockerell, R.A.

J. D. Coleridge (*except as to the resolutions relating to registration.*)

*H. Cole, C.B.

David Cox, jun.

Thomas Creswick, R.A.

Henry Darvill.

*C. Wentworth Dilke, (Chairman of Council.)

*John Dillon.

George Thomas Doo, R.A.

*William Dyce, R.A.

Andrew Edgar (*subject to the protest below.*)

Francis Ellis (*subject to the protest below.*)

James Fahey.

*Roger Fenton.

Edwin Field.

*Robert Fletcher.

*William M. Fladgate.

John Henry Foley, R.A.

William Powell Frith, R.A.

*George Godwin, F.R.S.

Louis Haghe.

William Hallows.

Solomon A. Hart, R.A.

William Hawes.

J. R. Herbert, R.A.

F. Y. Hurlstone, (President of the Society of British Artists.)

Joseph J. Jenkins.

*Owen Jones.

F. Joubert.

J. P. Knight, R.A.

R. S. Lauder (President of the National Institute of Fine Arts.)

*John Leighton, F.S.A.

John Linnell.

Daniel Maclise, R.A.

*William Mulready, R.A.

John Murray.

*Matthew Noble.

F. R. Pickersgill, R.A.

*Henry Pollock.

John Pye.

R. Rodgrave, R.A.

*Sir W. C. Ross, R.A.

George Scharf, jun.

Bell Smith.
 Frank Stone, A.R.A.
 Frederick Tayler (President
 of the Society of Painters
 in Water Colours.)
 Tom Taylor.
 *William Tooke, F.R.S.

E. M. Ward, R.A.
 H. Warren (President of
 the New Society of
 Painters in Water Colours.)
 *R. Westmacott, R.A.

* Members of the Society of Arts.

A protest was made by Mr. Robertson Blaine against the decision of the Committee upon the question of registration of works of Art as above stated, which protest was ordered to be entered upon the minutes of the Committee, and is as follows:—

The undersigned protests against a system of non-registration of works of Art for the following amongst other reasons:—

1. That, as between the author of a work of Art and the public, it is the only means by which a reliable record can be obtained of the time when the Copyright in such work will commence, and consequently when it expires.
2. That in cases where the author of a work of Art sells it, but reserves his Copyright therein, registration is the only certain and equitable mode by which the evidence of any such reservation can be preserved, and made to run with the possession of the work to which it relates, so as to be binding on all persons through whose hands the work may pass from the first purchaser.
3. That registration would always afford the authors of works of Art a certain and indisputable record that they are entitled to the Copyright of such of their works as are registered, unless their contracts for sale thereof appear upon the register.
4. That in cases of *piracy* of the Copyright, registration would form a most valuable record, at any distance of time, of the identity of the work pirated, the time and place of its first publication, and the name of the author; evidence of all which essential facts it would, after a considerable lapse of time, in most cases be found impossible to obtain except by means of a Register.
5. That the publicity of registration will materially aid in preventing a continuance of these acts of piracy and fraud to which artists and purchasers of works of Art are now exposed.
6. That the principle of compulsory registration has already been repeatedly established by the Legislature, viz., as to Copyright in Useful and Ornamental designs; and
7. Also as to works of Literature and of the Fine Arts under the International Copyright Act, and the various Conventions entered into by Her Majesty with Foreign States.
8. Because, by the existing Engraving and Sculpture Copyright Acts, no Copyright can be acquired in a work of Art unless the date of its first publication, and the name of the proprietor of the Copyright appear thereon, so that the public may know that a Copyright therein is claimed by the author, and when it will expire.
9. Because a system of registration would afford a cheap and easy mode of assigning Artistic Copyrights, by entry in the Register, as may now be done with respect to literary and musical Copyrights, as well as those in maps, charts, and plans.
10. Because, as the law now stands with respect to literary and musical productions, &c., no proceedings at law or in equity can be maintained for piracy, unless the work in respect of which Copyright is claimed has been previously registered.

11. And lastly, That with all these facts in favour of registration, it is unreasonable to suppose Parliament will grant the additional protection required as to Copyright in works of Art without making the registration of such works a condition precedent to the acquisition of any Copyright therein.

D. ROBERTSON BLAINE.

APPENDIX.

(A.)

MR. BLAINE'S REPORT TO THE COMMITTEE ON ARTISTIC COPYRIGHT.

In pursuance of the Resolution passed at the first Meeting of the Committee, I have prepared the following Report as to the existing English Common and Statute-law relating to Artistic Copyright.

I. As to the Common-law Right.

By the Common-law of England, no Copyright protection exists in favour of Works of Art, except to this limited extent, namely, that while they remain *unpublished*, without the consent of the artist, or owner, no one can lawfully publish them without such consent. This principle has become established by analogy with a long series of decisions, chiefly as to literary productions. Thus, where Her Majesty the Queen and the Prince Consort had made several etchings, and impressions thereof were taken for their private use, and not for publication; impressions of these etchings having been obtained by surreptitious means, and the parties in possession thereof being about to publish the same, the Court of Chancery, upon a Bill filed by the Prince, restrained the defendants from publishing the etchings, or any catalogue thereof. The Lord Chancellor (Lord Cottenham) upon that occasion, said:—"The property in an author or composer of any work, whether of Literature, Art, or Science, such work being *unpublished*, and kept for his private use or pleasure, cannot be disputed after the many decisions in which that proposition has been affirmed or assumed." His Lordship at the same time held that the exclusive right of the author in *unpublished* works depends entirely on the Common-law right of property therein.*

In a more recent case, decided in the House of Lords upon a question of Musical Copyright, Lord St. Leonards also said:—"The Common-law does give a man who has composed a work a right to that composition, just as he has a right to any other part of his personal property; but the question of the right of excluding all the world from copying, and of himself claiming the exclusive right of for ever copying his own composition, *after he has published it to the world*, is a totally different thing." His Lordship also held that no Common-law right exists after publication†

It was formerly held by Lord Mansfield, and other eminent Judges, that the authors of literary works had, by the Common-law, a copyright in their works *after* publication, and consequently that such Copyright was perpetual; but that doctrine was long since overruled by the House of Lords in the celebrated case of "*Donaldson v. Beckett*,"‡

The result is that the Common-law affords artists no protection whatever against the piracy of their works *after* the publication thereof by public exhibition, and that they are consequently dependent, for the very slender and imperfect protection they do enjoy for any Copyright in such works, upon

* *Prince Albert v. Strange*: 1 Hall and E. 413.

† *Jefferys v. Boosey*: 4 Clark & B. 2. G. 99.

‡ See 4 Burr. 2406; 2 Bro. P. C. 129.

II. The Statute-laws of Artistic Copyright.

These laws may be classed in the following divisions:—

1. The Engraving Copyright Acts.
2. The Sculpture Copyright Acts.
3. The British International Copyright Acts.
4. The Conventions and Orders in Council founded thereon.

I shall not notice the Useful and Ornamental Designs Acts, excepting so far as the latter relate to works of sculpture; because the designers of useful and ornamental articles have obtained a reasonable amount of protection in favour of their labours, and also because the objects of the Committee appear to be an investigation of the state of the laws of England relating to those productions which more strictly come within the definition of "the fine Arts," such as paintings, engravings, works of sculpture, &c.

The British Engraving Copyright Acts are:—

1. The 8th George II., c. 13, 1735.
2. The 7th George III., c. 38, 1767.
3. The 17th George III., c. 57, 1777.
4. The 6th and 7th William IV., c. 59, 1836.
5. The 15th Victoria, c. 12, sec. 14, 1852.

It will be observed that the first of these Acts is upwards of 120 years old. It does not in any way protect a picture or drawing, as such, from piracy after its publication; its object was to protect engravings from piracy, including therein, as I believe, the designs for such engravings, and also maps, charts, and plans. For that purpose it gave a term of fourteen years' Copyright in engravings which any person should invent and design, engrave, &c., or, from his own works, should cause to be designed and engraved, &c., such term of fourteen years to commence from the day of first publishing any such engraving; and that the public might know when that day was, and consequently when the Copyright would expire, the following conditions are imposed upon the proprietors of the Copyright in the engraving:—

1. That the true date of first publication shall be engraved upon the plate.
2. Also the name of the proprietor.
3. And that these particulars shall be printed on every impression taken from the plate.

This antiquated Act was framed upon the statute of 1735 relating to Literary Copyright Works, and with slight amendments has remained unaltered down to the present time. It is generally known as *Hogarth's Act*, from the circumstance of that great artist having obtained by his own endeavours, and almost at his sole expense; and which he has recorded upon a plate engraved by him in commemoration of that important and interesting event in his life.

Hogarth's Act only protected engravings made by an artist, or caused to be made by him from his own designs. His defect was remedied in 1767, by the Act of 7 Geo. III., cap. 38, and the term of Copyright was extended from fourteen to twenty-eight years, that being the increased term which had then been granted in favour of literary productions. This term of twenty-eight years Copyright in engravings still remains unchanged; and, as before observed, it commences from the day when the engraving is first published.

In 1777 the Act of 17 Geo. III., cap. 57, was passed, which after reciting the two previous Acts, that they had not effectually answered the purposes for which they were intended; that it was necessary for the encouragement of Artists, and for the securing to them the property of and in their works, and for the advancement and improvement of the arts of engraving, &c., that further provisions should be made for these purposes, it was enacted that, in addition to any damage the proprietor of the Copyright might recover for an infringement thereof, he should be entitled to double costs of suit. This

and other similar enactments as to double costs, were, however, repealed in 1842 by the 5 and 6 Vic. cap. 99, sec. 2, which, in lieu of such double costs, gives a full and reasonable indemnity as to all the costs, &c., incurred in and about the action which may be successfully brought by the proprietor in consequence of any infringement of his Copyright.

It was only so recently as 1836 that the English Engraving Copyright Acts were extended to Ireland, by the 6 and 7 William IV., cap. 59. Up to the time of the passing of that Act, engravings first published in England might be and were pirated in Ireland with perfect impunity; and those first published in Ireland were, in like manner, subject to piracy in England.

In consequence of doubts having been entertained whether "lithographs and certain other impressions" were within the protection of our Engraving Acts in 1852, it was declared by the 16 Victoria, cap. 22, sec. 14, that they were intended to include "prints taken by lithography, or any other mechanical process."

Having thus briefly stated the substance of all the existing British Engraving Copyright Acts, I will now point out what appear to be some of the chief defects in these statutes. I shall adopt the same plan with respect to the British Sculpture Copyright Acts; and will conclude with some notice of the British International Copyright Acts, and the Conventions and Orders in Council founded thereon, so far as they relate to Works of the Fine Arts.

The chief defects of the British Engraving Copyright Acts are,

- I. That they give artists no Copyright in their pictures, as such, but only for the purposes of engraving.
- II. They afford no protection to the purchasers of original pictures against the piracy thereof.
- III. They afford the public no protection against the purchase of spurious pictures, and thus operate as an encouragement to the grossest acts of fraud.
- IV. That architects are quite unprotected in respect of their published designs, unless engraved before publication.
- V. That the new art of photography is also entirely unprotected as respects Copyright.
- VI. That the existing Acts only extend to Great Britain and Ireland.
- VII. That the term of twenty-eight years Copyright is insufficient.
- VIII. The expense attendant upon the assignment of Copyright by deed.
- IX. And the expense attendant upon proceedings for the protection of Copyrights.

I. That the existing Acts give artists no Copyright in pictures, as such, but only for the purpose of engraving, will be fully understood when it is seen that, according to Hogarth's Act, a picture is only treated as a design for the purpose of engraving from. Both for fame and profit, Hogarth appears to have relied upon his original art, rather than that of a painter; it was his engravings that were pirated, and his Act was, therefore, framed to meet the requirements of his own case, and those of other artists similarly placed. Some of the chief mischiefs to which this state of the law exposes an artist are as follow,

1. After he has sold his picture he has no means of preventing its piracy, either as a picture, or for the purposes of engraving, excepting as between himself and the person to whom he has sold it. Contracts are often made by artists with the purchasers of their pictures, by which contracts the Engraving Copyright is secured to the artist. Such contracts are constantly avoided by the purchaser selling the picture to a third person without notice of the artist's contract as to the Copyright. He is thus defrauded of his property,

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warrant their embarking in a law-suit in one of the superior Courts.

All the legislation which has taken place upon the subject of Copyright in England has proceeded upon the just theory that an author or artist has a *property* in his work. Where, therefore, a Copyright work is *literally* copied, or copied with merely colourable alterations, it seems difficult to distinguish the moral guilt of such a theft from that of picking a pocket, and consequently that such an act of piracy ought to be punishable as a criminal offence.

The British Sculpture Copyright Acts are:—

1. The 38th George III., C. 71. 1798.
2. The 54th George III., C. 56. 1814.
3. The 14th Victoria, C. 104, ss. 6, 7. 1850.

These Acts form the sole protection against piracy which a sculptor has in respect of any Copyright in his works *after* their publication.

The first of the above Statutes gave a term of fourteen years' Copyright in new works of sculpture. The next revises that the previous Act had been found ineffectual for the purposes thereby intended, and also gave a term of fourteen years' Copyright in new works of sculpture, together with a further term of fourteen years if the sculptor should be living at the end of the first term, and should not have divested himself of his Copyright. Both these Acts impose the following *conditions* upon the proprietor of the Copyright in any work of sculpture, and these conditions must be strictly performed, or he forfeits his Copyright therein.

1. That the proprietor of the Copyright shall cause his name to be put on his work before the same shall be published; and—
2. Also the date of such first publication.

The above Acts were amended in favour of sculptors by the Ornamental Designs Act of 15 Vic. cap. 104, ss. 1, 7, which enables sculptors to bring such of their works as are "within the protection of the Sculpture Copyright Acts," also within the protection of the Designs Act upon condition of such works

1. Being registered under the Designs Act.
2. That the word "Registered" shall appear upon every copy or cast of the work published by the sculptor, or his assigns, after its registration; and
3. The date of registration.

The defects of the Acts relating to Copyright in Works of Sculpture.

These defects appear to be almost as important and numerous as those I have mentioned with respect to the Engraving Copyright Acts. The second, third, sixth, eighth, and ninth are applicable as well to the former as to the latter of these Acts, and I will therefore not repeat them. In addition, the following may be noticed:—

- I. The *certain* term of fourteen years' Copyright is insufficient.
- II. A sculptor can acquire no Copyright in his works for purposes of engraving.
- III. It seems doubtful whether a work of sculpture can be protected under the Designs Act without the performance of two sets of conditions.
- IV. The works of sculpture are most frequently pirated by a class of persons against whom the existing laws afford a useless remedy.

1. The *certain* term of fourteen years' Copyright is insufficient. It is only extended to twenty-eight years if the sculptor outlives the first fourteen after the publication of his work. The interests of his family are lost sight of in this arrangement, and that the present term of Copyright allowed for works of sculpture is insufficient *surely* must be admitted when it is remembered that twenty-eight years are conceded for engravings, and

forty-two years *certain* for books, music, maps, charts, and plans.

Sculptors have likewise a strong claim to an extended term of Copyright, from the peculiar nature of their works. It frequently happens that a sketch is made of a statue which is not commissioned for many years afterwards. Now, to insure his Copyright in such sketch, or first model, it seems that the artist must place his name and date upon it when he first publishes or exhibits it. The first fourteen years Copyright runs from that day, and may therefore expire before the work has been executed upon an enlarged scale, and consequently when so executed it would be entitled to no Copyright.

II. A sculptor can acquire no Copyright in his works for the purposes of *engraving*; a painter may. If well designed and engraved, the Copyright in a sculptor's works might be profitable to him in various ways; on the other hand, if they are badly designed and engraved, his professional reputation may be injured with those who have not had an opportunity of examining his works.

III. It seems doubtful whether a work of sculpture can be protected under the Designs Act, without the performance of the *conditions* I have noticed as being imposed under the Engraving Copyright Acts; and also those under the Designs Act, because the latter only extends to such works of sculpture as are "within the protection of the Sculpture Copyright Acts;" and no work can be brought within such protection without the performance of the conditions imposed by those Acts.

IV. The works of sculptors are most frequently pirated by a class of persons against whom the existing laws afford a useless remedy. These persons are generally indigent Italians, and other aliens, wholly unable to pay any costs or penalties which might be recovered against them. How defective the present Sculpture Copyright Acts are in this respect may be judged of by the fact that only *one* reported case arising under these acts is to be found. The instances of piracy are constant, but sculptors have wisely submitted to the invasion of their rights rather than embark in litigation with men of straw.

Report of the Select Committee on Arts and Manufactures.

In 1836 the House of Commons appointed a Select Committee "to inquire into the best means of extending a knowledge of the Arts, and of the principles of design, among the people (especially the manufacturing population) of the country; also to inquire into the constitution, management, and effects of institutions connected with the Arts." That Committee, by their Report, stated that they began their labours by dividing the subject of their inquiry into three parts; the two first being as to art as relating to manufactures; and the third, as to "the state of the higher branches of Art, and the best mode of advancing them." The Committee also stated that their investigations had been principally directed to the two first subdivisions of the subject, but they drew attention to the defective state of the law as affecting *Artistic Copyright*, especially as to works of sculpture, at the same time stating that "the expensiveness of a remedy through the courts of law or equity is a virtual bar to invention, and almost affords impunity to piracy "in Art;" that a system of *registration* appeared to be indispensable; and concluded their Report thus:—"It will give your Committee the sincerest gratification, if the result of their inquiry (in which they have been liberally assisted by the artists of this country) tend in any degree to raise the character of a profession which is said to stand much higher among foreign nations than in our own; to infuse, even remotely, into an industrious and enterprising people a love of Art, and to teach them to respect and venerate the name of 'Artist.'" Parts one and two of the Appendix to this Report contain a considerable amount of interesting and important evidence relating to Artistic Copy-

right. The Useful and Ornamental Designs Acts were subsequently passed; but, with the exception I have already noticed as to works of sculpture, our laws of Artistic Copyright still remain unaltered, except as to international rights, which I shall notice presently.

The passing of the Literary Copyright Amendment Act in 1842 was mainly attributable to the generous and unwearied exertions of the distinguished and noble-hearted author of "Ion," the late Hon. Mr. Justice Tal-
fourd. In a letter I received from him in 1853, after noticing "the necessity of a complete revision of the confused and ineffective statutes" relating to Artistic Copyright, he says, "in the first Bill which I introduced into the House of Commons, I included a series of clauses on this subject; but I subsequently, by the advice of Sir Robert Peel, confined the measure to Literary Copyright, as he thought that the difficulties attendant on the question between artists and the patrons of Art would only be solved by a Select Committee; and as this was a subject on which he was personally sensitive, I found it necessary to adopt his advice, or to encounter his opposition, which must have been fatal. I always, however, cherished the hope of bringing the subject before the Legislature until I ceased to be one of its members; and I shall rejoice if some one possessed of more influence should be induced to move for a Select Committee on the Statutes."

I have noticed this letter because it proves that its generous writer did not neglect the interests of artists, as has been supposed, in his long battle in the House of Commons to obtain an amendment of the laws of Copyright. It also proves that he, as well as one of the greatest British statesmen, the late Sir Robert Peel, knew and admitted the necessity for an amendment of our Artistic Copyright laws.

III. The British International Copyright Laws.

These laws consist of:

1. The Act of 7 Victoria, C. 12, 1844.
2. The 15 Victoria, C. 12, 1852.
3. And the various Conventions and Orders in Council made under the above Acts.

Before entering upon any notice of these Acts, &c., it seems desirable to state, that by the law of England, as it existed prior to the passing of any International Copyright Act, no Copyright could be acquired in the British dominions in respect of any literary or other work which had not been either first published there, or simultaneously with its first publication in any other State. The consequence of this principle of our laws of Copyright was to deprive *aliens*, as well as British subjects, of any Copyright in their works in every case where they were first published in any foreign State.

1. This injustice to the rights of intellect was at length partially removed for the first time in 1838. The Act then passed was repealed in 1844, by the 7 Vic. cap. 12, which enables Her Majesty, by Order in Council, to direct, as to books and *works of Art*, which shall be first published in any foreign country, to be named in such Order, that the authors of such books and works of Art, and their assigns, shall have the privilege of Copyright therein to be stated in the Order in Council, not exceeding that to which authors of similar works first published in the United Kingdom are entitled; but no such Order was to have any effect, unless it states that *reciprocal* protection has been secured by the foreign power, to be named in such Order, in favour of British Copyright Works. By this Act the benefits of, amongst others, the British Engraving and Sculpture Copyright Acts are extended and apply to such of the works named in the Orders in Council as such Acts shall be applicable to; but no such International Copyright was to be acquired, unless the work in respect of which it is claimed shall have been registered at Stationers' Hall within the period to be specified in the Order in Council.

2. In 1852, the 15 Vic. cap. 12 was passed, which re-

cognizes a Copyright Convention then made by Her Majesty with France, and extended the Engraving Copyright Acts "to prints taken by lithography, &c."

3. All the International Copyright Conventions which have been entered into by the British Government since the late "that no person shall be entitled to such protection as aforesaid, unless he shall have duly complied with the laws and regulations of the respective countries in regard to the work in respect of which such protection may be claimed." This stipulation applies to all descriptions of Copyright Works included in the Conventions.

International Copyright Conventions have been entered into by Her Majesty with the eleven following States, in pursuance of the powers contained in the above mentioned Acts. Orders in Council have also been issued in accordance with such Acts and Conventions.

1. With Prussia, in 1846 and 1855	Population 17,300,000
2. Saxony, in 1846	2,000,000
3. Brunswick, in 1847	900,000
4. The Thuringian Union, in 1847	900,000
5. Hanover, in 1847	1,810,000
6. Oldenburg, in 1847	180,000
7. France, in 1851	36,039,384
Colonies	3,506,218
8. Anhalt-Deessau-Coethen, and Anhalt-Bernbourg, in 1853	100,000
9. Hamburg, in 1853	200,000
10. Belgium, in 1854	4,000,000
11. Spain, in 1857	14,162,219
Colonies	4,628,633
	18,600,000

Total population of these States* 85,730,000

I have already noticed that the Act of Parliament which authorises Her Majesty by Order in Council enable *aliens* whose works are first published out of British dominions to acquire Copyright there, enacts that no such Order shall have any effect, unless states that *reciprocal* protection has been secured by foreign power, to be named in such Order, in favour of British Copyright Works.

It is a portion of the Prerogative of the Crown to enter into Conventions with foreign States. All those entered into by Her Majesty, as to International Copyright, expressly stipulate that from the date when such Convention "shall come into operation the authors of *Works of Literature or of Art*, to whom the laws of either of two countries do now or may hereafter give the right of property or Copyright, shall be entitled to exercise the same right in the territories of the other of such countries the same term, and to the same extent, as the authors of works of the same nature, if published in such country, would therein be entitled to such right, so the republication or piracy in either country of any work of Literature or of Art, published in the other, shall be dealt with in the same manner as the republication or piracy of a work of the same nature first published in such other country; and so that such authors in the one country shall have the same remedies before the courts of justice in the other country, and shall enjoy in the other country the same protection against piracy, unauthorized republication, as the law now does or hereafter grant to authors in that country." Also the terms "works of Literature or of Art," employed above, "shall be understood to comprise publications of books, of dramatic works, of musical compositions, of drawing, of painting, of sculpture, of engraving, of lithography, and of any other works whatsoever of Literature or of the Fine Arts."

All the Orders in Council founded on these Conventions also recite that a treaty has been concluded between Her Majesty and the Sovereign of the State

* See the *Almanach de Gotha* for 1858.

State named therein, "whereby due protection has been secured within (such foreign State) for the benefit of authors of books, dramatic pieces; musical compositions, drawings, paintings, articles of sculpture, engravings, lithographs, and any other works of Literature and of the Fine Arts, in which the laws of Great Britain and of (such foreign State) do now or may hereafter give their respective subjects the right of property or of Copyright."

As to the Artistic Copyright Laws of the above-mentioned Foreign States.

Inasmuch as Orders in Council in favour of International Copyright are only legal when reciprocal protection is therein stated to be secured in favour of British Copyright Works within the territories of the foreign power mentioned in such Order, it would have been much more satisfactory if the Conventions entered into by Her Majesty had defined what works are the subject of Copyright within the territory of each of the States which is a party to such convention. What are "works of the Fine Arts" according to the laws of the Foreign States in question? Upon this point the Conventions contain no certain information whatever.

By Resolutions of the Diet of the Germanic Confederation literary productions of all kinds, as well as "works of art," are protected from multiplication, by any mechanical means whatever, without the consent of the author or his assignee of the original work. This general law as to Copyright is binding on all the States composing the Confederation, but does not appear to exclude them as sovereign states from making or altering their own laws of Copyright if not inconsistent with the Resolutions of the Diet.* The term of Copyright granted by the Diet is now extended to the artist's life and thirty years afterwards.† All the German States which have entered into Copyright Conventions with Her Majesty are members of the Confederation, and, with the exception of Prussia and Saxony, I cannot ascertain that any of them have any special law of Copyright.

The Prussian Code of Copyright, passed in 1837, has been eulogised by a distinguished French jurist as the most complete in existence on the subject ‡.

As a legislative enactment it appears to be so; but it is by no means so liberal or just as the laws of France in favour of literary and artistic productions. The Prussian Code expressly prohibits the reproduction of drawings or pictures by engraving or lithography, coloured impressions, &c., &c. It also prohibits the reproduction of sculptures of all kinds during the period for which the Copyright is granted, and which remains the property of the artist so long as the original work belongs to him; but when the artist parts with his work, in the absence of any special contract with the artist to the contrary, the right passes with the possession of the original work.§ The term of Copyright accords with that granted by the Diet of the Germanic Confederation, namely, for the artist's life and thirty years afterwards.||

The Saxon laws of Copyright also give a similar term of protection to artists in respect of the reproduction of their works.¶ The French Code on the subject of Copyright generally, and especially as to that which relates to works of Art, is of a very simple character; but a long series of decisions of the courts have gradually extended the meaning of the language of the Code, until it may be said to include not only drawings, paintings, and sculpture, but also engravings of all de-

scriptions, and in all kinds of materials.* M. Rénouard, in treating upon the French laws of Artistic Copyright, says, "Copyright (*le droit de copie*) belongs to painters, designers, and sculptors in their productions, as well as the corporeal property of these productions themselves. That an artist may distinguish between these two rights; that he may sell his original picture, and retain the right to engrave or copy it; that he may sell the right to engrave and retain the proprietorship in the original; that he may sell these diverse rights to different persons is what no one would for an instant doubt."† By a decree of 1852, it is declared that the piracy on the French territory of works published abroad, and mentioned in Article 425 of the Code-penal, shall constitute an offence; also the importation and exportation of pirated works generally. Alien artists, &c., therefore, now enjoy in France the same protection, in respect of their works, as if they were French subjects, although such works are not first published there. By a decree of 1798, amended in 1854, the term of Copyright granted in France is not only for the artist's life, but that of his widow, and also for the artist's children during thirty years from the death of their surviving parent; if the artist leaves no children, then it vests in his next of kin for ten years.

The Belgian laws of Artistic Copyright appear to extend to the same objects of Art as the French; but the utmost term of Copyright allowed in Belgium is for the author's life, and twenty years afterwards.‡

The Spanish law affords to painters and sculptors protection in favour of the reproduction of their works by engraving or any other process. This Copyright continues during the artist's life and for fifty years afterwards.§

By the Copyright laws of Germany, France, Belgium and Spain, as regards the productions of painters, their pictures are wisely made the primary objects of protection:—under the British Engraving Acts the engravings from pictures are made the primary objects. This radical defect in our laws can only be remedied by repealing all the existing Acts on the subject, and passing such a new and well-considered measure as will, at least, put our laws upon a footing of equality in justice with those of the foreign States who have entered into Conventions with her Majesty.

In conclusion, I will only add the following observations upon the existing laws of British Artistic Copyright:—

1. That they afford the producers of works of Art no sufficient protection against the piracy of their productions.
2. That the purchasers of works of Art are in the same position.
3. That in consequence of the defective state of our laws of Artistic Copyright, they afford a premium for the manufacture of piratical works.
4. And lastly, that the International Copyright Conventions entered into by Her Majesty, being based upon the principle of reciprocity, our defective laws are most unjust towards the subjects of France, and all the other States who have entered into such Conventions, because their laws afford British artists an amount of protection in favour of their works which far exceeds that which is obtainable by artists, either native or foreign, under the British laws of Artistic Copyright.

D. ROBERTON BLAINE.

Temple, 6th January, 1868.

* Rénouard's *Droits d'Auteurs*, vol. i. p. 280 et seq.

† Blanc et Beaumais's *Code général de la propriété littéraire et artistique*, p. 222, et seq.

‡ Rénouard's *Droits d'Auteurs*, vol. i. p. 268.

§ *Ibid.*, vol. i. pp. 272, 273.

|| Blanc et Beaumais's *Code général de la propriété littéraire et artistique*, p. 292.

¶ *Ibid.*, p. 300.

* Rénouard's *Droits d'Auteurs*, vol. ii. pp. 78 et seq.

† *Ibid.* pp. 300 et seq.

‡ Blanc et Beaumais's *Code général de la propriété littéraire et artistique*, p. 314.

§ *Ibid.* pp. 250, 251.

(B.)

ARTISTIC COPYRIGHT COMMITTEE.

Society for the Encouragement of Arts, Manufactures,
and Commerce, Adelphi, London, W.C.
January 27, 1868.

SIR,—I have to request your attention to the resolutions below, passed by the "Artistic Copyright" Committee. This Committee has been formed by the Society of Arts in the hope that, by collecting facts, and by showing the mischiefs to which artists, and the purchasers of works of Art are liable, in consequence of the present defective state of the laws of British Artistic Copyright, Parliament may be induced to amend those laws. The Committee will be obliged by your early attention to the enclosed questions. In answering them it is suggested that you should omit the names of persons connected with the facts you state; you are also recommended to confine yourself to circumstances within your own knowledge, not giving those derived from the information of other persons.

The Committee request the favour of a reply not later than Thursday, the 4th of February.

I am, Sir, your obedient Servant,

C. L. EASTLAKE,

Chairman of the Committee.

Resolved, That the inquiries of this Committee be directed,—

1. To ascertain the existing laws of British Artistic Copyright, and the chief defects of those laws.

2. How those defects affect the interests of producers of works of Art.

3. How they affect the interests of purchasers of works of modern Art.

4. How they affect the interests of the public and the promotion of the Fine Arts.

5. How they affect the subjects of those foreign States with whom Her Majesty has entered into International Conventions; and what the laws of those States are as affecting Artistic Copyright.

6. To obtain instances of fraudulent or wrongful acts relating to works of Modern Art.

7. And lastly, to suggest such remedies as appear best calculated to amend the defects of our Artistic Copyright laws.

By order,

P. LE NEVE FOSTER,

Secretary.

(C.)

SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND COMMERCE.

THE ARTISTIC COPYRIGHT COMMITTEE.

1. When the pictures of British artists command good prices, is it a common practice that spurious copies of such pictures are made?

2. Are such spurious copies usually made of the same size as the original pictures, and as closely as possible to resemble them?

3. Where the original picture has been signed by the artist, is it a common practice to imitate or add such signature upon the spurious copies of it?

4. Do you know, and will you state, any instances where spurious copies of pictures have been shown to you for your opinion thereon; or have been sold, or offered for sale, or exchange, as original pictures?

5. Did the persons so selling, or offering for sale or exchange, such spurious copies know them to be so? or had such persons, in your opinion, reasonable cause for believing them to be spurious copies?

6. Do you know, and will you state, any instances where artists have, at the time of selling their pictures, expressly reserved their Copyrights therein for the purposes of engraving, and yet have subsequently been deprived of the profits of such Copyrights; and how were they so deprived thereof?

7. Do you know, and will you state, any instances where artists have not reserved their Copyrights when they sold their pictures, and where the proprietors thereof have either sold the Copyrights for the purposes of engraving, or gratuitously allowed them to be engraved without the consent of the artists who painted them, without giving them any remuneration for the Copyright?

8. Do you know, and will you state, any other facts which in your opinion are calculated to promote the objects of this Committee, as shown by the resolutions set forth herewith, either as relating to works of sculpture, and to architectural designs, pictures, drawings, sketches, engravings or photographs?

9. Will you suggest such alteration of our existing laws of Artistic Copyright as, in your opinion, will prevent the continuance of any and which of the grievances to which the present state of such laws exposes sculptors, architects, painters, engravers, publishers, and purchasers of works of Modern Art; and would likewise tend to the promotion of the Fine Arts in the British dominions?

(Date and Address.)

(Name.)

N.B.—The spaces left as above are for your answer. If not sufficient, you can write them upon a separate paper, numbering each of your answers to accord with the number of the question. In answering these questions it is suggested that you should omit the names of parties connected with the facts you state; you are recommended to confine yourself to circumstances within your own knowledge, not giving those derived from information of other persons.

SIXTEENTH ORDINARY MEETING

WEDNESDAY, MARCH 24, 1868.

The Sixteenth Ordinary Meeting of the Hundred and Fourth Session, was held on Wednesday, the 24th inst., Joseph Glynn, F.R.S., Vice-President, in the chair.

The following Candidates were balloted and duly elected members of the Society:—

Bowley, Robert Kanson.
Brooks, Shirley
Dyce, William, R.A.

Paula, Joseph Mitchell
Rider, Joseph
Thorman, Edward H.

The following Institutions have been taken into Union since the last announcement:—

457. East Lancashire Union.
458. Selby Mechanics' Institute.

The Paper read was:—

ELECTRO-MAGNETISM AS A MOTIVE POWER.

BY THOMAS ALLAN.

It is superfluous to enumerate the many material advantages electro-magnetism has over steam, from great simplicity, compactness, constant power and velocities, and being entirely under control. We have a reservoir of danger as in the steam-boiler,—always ready for action, without previous consumption of material as in getting up steam,—and no waste in freightage in carrying coal.

The two points to solve in the use of electricity, moving power are its application and economy.

Hitherto, every application of electro-magnetism has been put to a practical trial has been attended either with the laws of electricity or mechanics.

is shown, that electric action, by an application of the laws and properties, of motive-power.

When applied in the form of a current, the effect is great from comparison, but the effect decreases so rapidly with distance, being "inversely as the square of the distance much higher than the effect of the maximum effect or of the force, with a consequent loss of effect, is so small a distance as to be in mechanics. The great difficulty of such an arrangement is that the maximum of the dynamic effect is unobtainable in itself, and the motion as to be available as a motive-power.

The elements of these inventions, the application of the dynamic effect, is applied, the separation of parts, is successively applied, the attraction in a direct form, the loss of the primary electric force, and any length of stroke,

The power has generally, though not so great as to render electric action less profitable than steam. The misapplication of the electro-motive power, the necessary consumption of the force, the consumption is inversely as the force.

The electro-motive power, will be an important element, tending to alter the mode of commerce and manufacture, as its adoption.

The application of the foregoing summary of the important problem in physical science, still progressive, that forms the basis of the power; and although the final solution is not yet out, I will endeavour to detail the progress as well as the *modus operandi* as they have progressed, to effectuate

the evident vastness and importance of the enlightenment of the present age, and the curious to observe with what stubbornness and discouragement any such invention or discovery is met with the routine of bye-gone times.

Electro-motive power, *par excellence*, is met with fully more incredulity and disbelief than steam or gas did in their infancy. The subject even seriously is to be next thing to a lunatic, and the signal to be against one, a barrier of apparently insurmountable difficulties, the fancies and jealousy of vested interests, the disappointments of various crude attempts, to say nothing of the dogmas of the sciences of a sister science. Some such, with their small powers of philosophical conception, and with unbecoming flippancy, to crumple up a subject with a wizard-like *ipse dixit* of impossibility, to cost, based on anomalous and untested

Liebig, in his "Familiar Letters," goes out of his way to run a tilt against electro-motive power, and patronisingly remarks "that electro-magnetism as a motive-power is engaging to the eye and study; wonders are expected to be accomplished in this purpose; such expectations are very attractive, indeed, they must be so, as they would occupy himself with them, and are altogether fallacious; they are illusions, and the fact that those who entertain them make the necessary comparisons and calcula-

tions." He then reminds his readers "of what chemists denominate "equivalents," and likewise that zinc in the battery is burned (oxidised), a consequence of which action is the production of an electric current." We are then informed that "out of nothing no kind of force can arise," and "if we were to burn the zinc under the boiler of a steam-engine, consequently in the oxygen of the air instead of in the galvanic pile, we should produce steam and get a certain amount of force," but that "we must still recollect that zinc can be represented by an equivalent weight of carbon (as coal), so that, according to the experiments of Despretz, six pounds weight of zinc, in combining with oxygen, developes no more heat than one pound of coal, consequently, under equal conditions, we can produce six times the amount of force with a pound of coal as with a pound of zinc." There is in all this no small amount of confusion of ideas pegged upon the experiments of Despretz which cannot fail to mislead, having nothing to do with the mechanical force of magnetism produced by a given amount of current electricity.

It is a most unfortunate doctrine, but also a practical absurdity, to state that zinc cannot give out more power than the coal required to melt it. Doubtless a given amount of zinc, combining with oxygen, would not eliminate more heat than would overcome that affinity, but there is no such relation of heat to electricity as to make the mechanical power of the one the measure of the mechanical power of the other. Whatever may be the analogy between heat and electricity, they must be considered as distinct forces in their mechanical relations. In the combustion of coal, heat only is the motive-power developed, whereas in the oxidation of zinc in the battery, both heat and electricity are developed, the latter only being the motive force.

Prof. Page, on this subject, remarks, "The absolutism of forces regulating affinities may be interesting as a matter of speculation, but as furnishing a practical estimate for the amount of mechanical or available power, it cannot stand, and necessarily involves the unwarrantable assumption that the whole power or inherent force may be eliminated and rendered available in each case." But Liebig goes still further. He maintains that the heating power of the current is the equivalent of the mechanical power through electro-magnetism, or, in other words, that the heat developed by the passage of the current, ought to raise steam enough to furnish a power equivalent to the electro-magnetic power of the same current, and from the fact that the mechanical force derived from the steam raised by the heating power of the current is so small, compared with that obtained by the combustion of coal, he arrives at the conclusion that electro-magnetic power "can never be used."

The cost, however, of such a power is but a subordinate question, as other and more important points have to be settled first, before the cost can be fairly ascertained.

The speculation is thus pushed up to a point where facts are brought to bear upon it, and fortunately where facts enough can be adduced to subvert the whole doctrine.

Desiderating cause and effect, and taking a practical survey of the whole subject, the problem appears to resolve itself more into one of mechanics and mathematics, than of chemical equivalents, for, let the cost of a given amount of electricity be what it may, we must see how that is to be economically applied to produce magnetism, in the first instance, and, again, how the dynamic effect of magnetic attraction is to be applied to machinery in accordance with its known laws, and that, too, to produce such an amount of motion or stroke as will be available to motive machinery.

It is to this end, then, that those who choose to think for themselves are not turned aside from the investigations of such a subject by the various discouragements thrown in their path, but, heedless of the dried leaves of theory of those who, without the comparative

ARTISTIC COPYRIGHT Society for the and Com...

SIR,—I have to report
the following, passed by the
Committee. This Committee
of Arts in the
by showing the mis-
classers of works of art
present defective
Copyright, Public
laws. The Committee
attention to the
it is suggested that
connected with the
wounded to confine
own knowledge, and
ination of other cases.

The Committee
than Thursday, 1st

I am, Sir,

Resolved, That

directed,—

1. To ascertain the
Copyright, and
2. How the
of works of art
3. How the
of modern art
4. How the
promotion of
5. How the
with which the
Copyright is
6. To
relative to
7. And to
calculate the
law.

SOCIETY

The

1. What
reasons, is it
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size as the
the artist
3. What
artist, is it
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for your op-
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where art
expressly to
name of the
relieved of
they see

table, the eight upper sections as against the in the present system, where attraction is this would give in the former a mean force of a given space, as compared to 555 in the an equal consumption of electricity, making in cost as to the power utilised as 46 to 1, supposing the rotary system could be practically to utilise 9-10ths of the curve, the ratio of it still be in favour of the latter as 24 to 1. Actually, this would be a great stride in the direction as to cost, and almost conclusive, if we send on a statement in a paper of Mr. Hunt's to say some years back, that electro-magnetism as was impracticable, the cost being in an engine as principle a hundred-fold as compared with upon this showing, so far as the utilization of the curve goes, all else being equal, the relative in cost of steam and electro-magnetism as a comes reduced to something within reasonable

second part of the question, as to the proper of parts so as to produce the maximum of effect with the minimum of electrical consumption, there is much still to be investigated, as there to be no law yet worked out that would be a true in this subject. I have given much consideration point, and have obtained many practical data in great question at issue.

instance of misapplication of current force, I mention an extreme case, indicating by comparison, consumption or waste and little effect. A magnet electrical consumption of 362, gave out a sup-power of 2½ cwt., at half-an-inch distance from the of the magnet, whilst another with the same bat- a consumption of 512 (owing to the shortness of it) only gave out an attractive power of 48 lbs. same distance. In another case, where two mag- different diameters and circuits consumed exactly ne amount of electricity, the one gave out an at- force at a certain distance of 97 lbs., where the ve 476 lbs. at the same.

so two cases, although extreme ones, clearly show the important question of cost, to a certain extent, and that, without complete investigation, and the shment of well-defined data, as to proportions re- ly, so as to produce the maximum magnetic effects the minimum of electrical consumption, the econo- of the question, as regards this section of it, will be a varying quantity, and, as hitherto, greatly left

the third portion of the question, viz., the econo- production of electricity, it may with safety be asked that, with all its improvements, the battery is clumsy affair; what, then, may we not expect from ries of scientific researches into the as yet unde- secrets of this marvellous element.

must be obvious, from the foregoing, that, as I at first, electro-magnetism as a motive power was simply a question of chemical equivalents or of pro- ing electricity cheap, but more essentially to ascer- the economical application of it to produce magnet- in the first instance, and then to contrive such an arrangement of parts as will produce stroke or motion in machine along with an economical application of that ce when so produced. It, therefore, follows that, about a properly combined investigation of these three questions as a whole, and an application of forces in ac- cordance with their known laws, it would be but a waste of time, barren of results, as appears to have been the case hitherto with many expensive experiments made in various countries, disregarding this triplicate application of dynamics in mechanical and physical science.

I have not in this paper entered into the mass and minutiae of detail, as only tending to confuse, and other illustrations that yet stand opposed to ultimate and complete success, but have treated the subject generally, and

as a progressive one, so as to bring out with as much force of character as possible the broad features of this interesting problem, and the main principles of the applications of the forces by which it is ultimately to be solved.

I have only now to repeat what I started with, that "hitherto every application of electro-magnetism that has been put to a practical trial, has been at variance either with the laws of electricity or mechanics," and also, that "the power of electricity, when applied in the form of an electro-magnet, is wonderfully great from comparatively small means, but its dynamic effect decreases so rapidly through intervening space, that the range of the maximum, with a consequent minimum of consumption, extends to so small a distance as to be of no real value in mechanics; the great problem to solve is how to contrive such an arrangement of parts as to convert this maximum of the dynamic effect through a range, although unavailable in itself, into *stroke*, or such an extent of motion as to be available and of practical value as a motive-power."

Confident, therefore, that the principles on which the mechanical and physical applications of the electrical and magnetic forces are based, and as enunciated in the foregoing, to obtain the elements of motion and power in a machine by such agencies, are correct, in fact, having not only hit upon the right principle, but laid the foundation for its adoption, I feel every incentive, and a strong impelling power besides, to carry forward such investigations, despite all discouragements, feeling assured that the difficulties in details will, in due time, yield to further knowledge and experience of the phenomena of the peculiar forces under investigation, so as to render electro-magnetism as a motive-power a practical and useful agent in the various works of man.

We have witnessed the great revolutions effected by steam within the last forty years, both on sea and land; it is an agent continually advancing, exercising incalculable influence on the wealth, and not less decidedly on the moral progress of nations—in one word, contributing to the march of civilisation throughout the globe—furnishing the apt illustration of the oft-repeated adage, "Knowledge is power." Rapid as have been the advance and expansion of steam-power, with its manifold applications to the wants of mankind—remarkable as its progress may still be, it cannot be disguised that a new motive power is perhaps the great desideratum at the present stage of mechanical science. There is a growing want felt; the requirements that have been mainly evolved through steam itself having apparently outstripped the agency that has called them into being.

The introduction, therefore, of electro-motive power—its bearings upon all questions of commerce, manufacture, and civilisation at home and abroad, opens up to the contemplative mind of the political economist a wide field of speculation, and becomes a question of great national importance, tending as it must to further alter the relative value of every article of commerce and manufacture as steam has done since its introduction.

If, then, with electricity, we can produce motion and power in a practical and useful form, and so carry forward for the benefit, advancement, and civilisation of mankind, that good work so happily commenced by steam, what a grand problem would then be solved.

The unphilosophical manner in which some people allude to electro-motive power superseding steam, is of a nature greatly to excite prejudice against a due consideration of the political economy of such agencies. Common sense, and a proper deference to the philosophy of common things, indicates that electro-motive power will no more supersede steam than steam the water-wheel, as each and all have their own field of operations and functions to fulfil peculiar to themselves; the cost, the power, and the various advantages of either being relative to the requirements of their respective applications as motive forces.

of thought, beg the question, seek to apply the dynamic effects of magnetism to machinery.

The power exhibited by electro-magnetism, though very great, extends through so short a space as to be practically useless in mechanics. A powerful magnet might be compared, for sake of illustration, to a steam-engine, with an enormous piston, but with an exceedingly short stroke, (*per se*) unquestionably a bad arrangement, or, rather, no arrangement at all, yet, if such mechanical arrangements could be devised, so as to take advantage of this enormous piston, and, at the same time, to produce stroke, without militating against that power or increasing consumption, then we would have a machine containing the elements of power and motion, without which the question of the cost of producing the electricity and, still more, its application to produce magnetism, are irrelevant and secondary in the first stages and practical investigations as to producing power and motion in a machine by such agency.

It has, consequently, appeared to me that in working out this problem it should be considered in three distinct parts.

First. How to apply the force of magnetic attraction economically in a machine, taking advantage of its maximum force, only with a consequent minimum of consumption, and continuing that power to any length of stroke required.

Second. How to establish the right proportions between a given amount of electricity and the length and diameter of a magnet, so as to produce the maximum of magnetic effect with the minimum of electrical consumption.

Third. The economical production of electricity and working of the battery.

Before going into any questions of application, it would be profitable to inquire into the peculiarity of the forces about to be dealt with as a guide, to the mechanical arrangements necessary to produce motion and power with economy in consumption.

The static force of magnetism is, to the casual observer, something immense from apparently very few means; whilst the dynamic effect, which is what we have to deal with, and render available as a moving power in mechanics, is a force peculiar to itself, and differs from others we have in nature, and therefore requires to be considered *per se*, without reference to, and regard to other forces as applied to motive-power.

The dynamic effect of magnetic attraction depends on the inverse ratio of the squares of the distance; be seen if the geometric curves of that force be measured from some focal point within the length of the magnet, and as the consumption of electricity by the battery so produces motion in accordance with the time taken for the attraction to pass through a given space, it follows that the time taken from the magnet where the force is greatest, the consumption is greatest proportionally; approaching the magnet where the force is least, the consumption is least; in a working machine, at an even speed, the time being equalised for each distance passed through, we may, therefore, be sufficient as a question, consider the time for equal spaces, the distances being equal, although of the attractive force, and a resistance, it may be said, but it may appear, that the force, and being inversely as the squares, the time, be inversely as the forces.

The curve of dynamic effect, and the calculations of it, show that if a magnet at an inch distance of one pound, at half an inch distance, sixteen, and so on, is carried out, and the whole of the motive powers divided into ten, the means of the forces throughout the whole distance res-

mean force of the ten pounds, that of the ten, and, as we have seen, material to be attracted, engine in motion, of electricity and of power, as to

Calculating of the magnetic force is only an approximation, the dynamic effect of attraction, point within its position on this, under mean dynamic attraction that in the end, calculate to

In the forces, necessary, poles, force, general, plan, we

the same work that was done by the electro-magnetic machine when the cost of coal at £1 per ton, and that of zinc at £27 per ton, it followed that power produced by a perfect electro-magnetic machine would cost nearly 300 times more than the same power produced by a perfect caloric or steam-engine. It must, however, be remembered that neither the present steam-engine nor the best electro-magnetic engine ever produced, realised anything like the full theoretical result; but it could be shown that the relative loss of power in the electric engine was much less considerable than in the best steam-engines of the present day, and that consequently the latter left the greater margin for future improvements. Mr. Allan had met the theoretical objections to his engine by an indirect argument. He said that if the power produced bore a certain proportion to the electric current expended, then the attractive force of the electro-magnet upon the armature should be the same when in greater or less proximity to each other, where experience proved that the attractive force increased rapidly inversely as the distance, while the expenditure of the current remained the same. To his (Mr. Siemens's) mind, this only proved that there was a great waste of current (in addition to the necessary expenditure) when the armature was at some distance from the poles of the electro-magnet, and did not at least affect the theoretical question. With regard to the mechanical arrangement of the machine brought forward by Mr. Allan, he (Mr. Siemens) observed a serious loss of power that resulted from the sudden stoppage of the armatures in their descent. Mr. Allan produced, by this arrangement, much useless sound instead of useful mechanical effect. Mr. Highton had alluded to the possible employment of substances less costly than zinc for the production of electric currents. If such substances could be discovered in nature, he (Mr. Siemens) admitted that the electro-magnetic engine might supersede the steam-engine for many purposes, but, in looking around him, he could not discover any substance in nature at all likely to answer the desired purpose, except it be coal itself. The substance in question must necessarily be simple, so as to be capable of combination with oxygen or other simple elements; but all things in nature were found in a combined state except the precious metals—sulphur and coal—which might be taken for pure carbon for the present purpose). All these substances were remarkable for their repugnance to oxidation at the ordinary temperatures, and if carbon should ever be made suitable to take the place of zinc in an effective galvanic battery, it must be at very elevated temperatures. The liquids employed in such a battery would, probably, have to be salts, in a state of fusion instead of solution. It would, of course, be impossible to say whether a battery of such a description could ever be made available, but he (Mr. Siemens) felt convinced that the only chance of producing a practical electro-magnetic-power engine consisted in improving the means of obtaining the electric current, rather than in the mechanical contrivances for utilising it.

Mr. HENLEY said he had expended many hundreds of pounds of his own money, and several thousands of other people's, under various patents, in the prosecution of this subject, but he had never yet seen anything in the electro-motive power that could at all be brought into comparison with the steam-engine. He had made a magnet which would sustain the weight of 15,000 lbs.; but when the keepers were placed three or four inches from the magnet it would not exert a force of more than four or five pounds, and the cost of obtaining about half-horse power with such a machine was nearly £5 per day. He was, therefore, sceptical as to any practical advantages from the application of this principle. He might say that the machine exhibited that evening w

of zinc absorbed only 6 measures of oxygen, whereas a lb. of carbon took up 33 measures in forming oxides. But carbon, when properly burnt, took up two equivalents, or 66 measures of oxygen, which gave it the advantage over zinc in the proportion as 66 to 6, i. e., 11 to 1. Taking the cost of coal at £1 per ton, and that of zinc at £27 per ton, it followed that power produced by a perfect electro-magnetic machine would cost nearly 300 times more than the same power produced by a perfect caloric or steam-engine. It must, however, be remembered that neither the present steam-engine nor the best electro-magnetic engine ever produced, realised anything like the full theoretical result; but it could be shown that the relative loss of power in the electric engine was much less considerable than in the best steam-engines of the present day, and that consequently the latter left the greater margin for future improvements. Mr. Allan had met the theoretical objections to his engine by an indirect argument. He said that if the power produced bore a certain proportion to the electric current expended, then the attractive force of the electro-magnet upon the armature should be the same when in greater or less proximity to each other, where experience proved that the attractive force increased rapidly inversely as the distance, while the expenditure of the current remained the same. To his (Mr. Siemens's) mind, this only proved that there was a great waste of current (in addition to the necessary expenditure) when the armature was at some distance from the poles of the electro-magnet, and did not at least affect the theoretical question. With regard to the mechanical arrangement of the machine brought forward by Mr. Allan, he (Mr. Siemens) observed a serious loss of power that resulted from the sudden stoppage of the armatures in their descent. Mr. Allan produced, by this arrangement, much useless sound instead of useful mechanical effect. Mr. Highton had alluded to the possible employment of substances less costly than zinc for the production of electric currents. If such substances could be discovered in nature, he (Mr. Siemens) admitted that the electro-magnetic engine might supersede the steam-engine for many purposes, but, in looking around him, he could not discover any substance in nature at all likely to answer the desired purpose, except it be coal itself. The substance in question must necessarily be simple, so as to be capable of combination with oxygen or other simple elements; but all things in nature were found in a combined state except the precious metals—sulphur and coal—which might be taken for pure carbon for the present purpose). All these substances were remarkable for their repugnance to oxidation at the ordinary temperatures, and if carbon should ever be made suitable to take the place of zinc in an effective galvanic battery, it must be at very elevated temperatures. The liquids employed in such a battery would, probably, have to be salts, in a state of fusion instead of solution. It would, of course, be impossible to say whether a battery of such a description could ever be made available, but he (Mr. Siemens) felt convinced that the only chance of producing a practical electro-magnetic-power engine consisted in improving the means of obtaining the electric current, rather than in the mechanical contrivances for utilising it.

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the best he had ever seen. It would certainly be very advantageous for purposes where steam could not well be employed, and no one would rejoice more than himself to see it successfully carried out.

Mr. LAWRENCE would have been glad to have heard more from Mr. Allan as to the cost of working these machines, as that was, after all, the important practical part of the question. It would appear, from the statement of Mr. Siemens, that the cost, as compared with steam, was as 300 to 1; and, at that rate, to drive a locomotive engine by magnetic power, instead of costing 6d. per mile, as at present, would give a cost of somewhere about \$15.

Mr. NEWTON said some twenty years ago, a machine, worked by electro-magnetic power, was sent to the house with which he was connected. It was upon the rotary principle, but, being a small and somewhat rough model, it did not work very well. There was, however, a certain amount of power got out of it, and, bad as it was, it satisfied him that there was a power to be obtained if effectual means could be discovered of developing it. A hundred years ago, the application of steam as a motive power was very little known, and it was the genius of Watt and Stephenson which had developed the capabilities of that power to its present enormous extent. He was much pleased with the machine exhibited that evening, and he thought a step had been made in the right direction. The observations of the various speakers applied rather to the cost of working than to the mechanical arrangements, and he thought that consideration had been too closely mixed up with the subject. He considered the first object was to find out the means of applying a power which was known to exist, and when that was accomplished attention might then be turned as to the best means of obtaining that power. The same objections were raised against the electric light when it was first introduced. The apparatus brought out at that time was very ingenious, and accomplished all that was required with the exception of cost. It was the same with the machine before the meeting. He thought the two questions ought to be kept separate from each other. First let the fact be established that such a motive power did exist, and he believed that genius and science would find out the means of supplying it as a cost which would render it practically useful.

Mr. WILLIAM HAWES thought it was one of the first duties of this Society to encourage the exhibition of machinery—no matter how novel or at what cost it was worked. Although he was one of those who thought that the machine before the meeting was no practical advance upon what was known before, still the exhibition of such a machine, and the new ideas it gave rise to, tended to promote progress. He felt bound to say he did not think that, in the present instance, success was likely to result from the talent and money expended upon these attempts. It had been properly described as a question between steam and electricity. Mr. Allan had pointed out the advantages of such machinery in situations where fires and steam-boilers were not admissible, but in looking at the machine before them, the apparatus outside the room must not be forgotten. The large batteries required to give motion to the little machine must not be overlooked. Let a comparison be made between the materials composing those batteries with the cheap and readily obtained materials (coal and water) with which a steam-engine of ten times the power of the engine before them and occupying hardly more space, could be worked. He thought it wrong to pay compliments to any one who he believed was pursuing a mistaken course. He did not wish to throw any discouragement in the way of Mr. Allan, but how little progress had been made in the application of this power, notwithstanding the attempts which men of science and genius had made for the last twenty years.

was analogous to that of the electric light. It was, no doubt, had been made in the produc-

tion of it, but it was still only available where cost was no object. It could not be used for street lighting or domestic lighting. Still that was all the progress that had attended the researches and labours of some of the most eminent men of the age for many years past. He believed the great duty of mechanics in general, and of this Society in particular, was to encourage—not complicated machinery, but to cultivate the most simple forms, and the adaptation of the most simple elements, and those marked out by nature as the cheapest and most easily convertible to their use. He should prefer to see Mr. Allan devoting his great abilities to some more practical and useful subject than that now before the meeting would, in his opinion, ever prove.

Mr. SPENCER said, looking back at the slow progress which had been made during the last 100 years in the development of the great agent, steam, he was not without hope with regard to the subject before the meeting. He thought pioneers of every great discovery deserved encouragement, and he had no doubt whatever that what had been exhibited that evening, was but the beginning of a great and important improvement. Although he had no practical acquaintance with the subject, yet economy of fuel in the generation of steam had occupied his attention through life; and although he scarcely thought that he should live to see it, yet he believed that electro-magnetic motion would ultimately be brought into practical use. The past history of steam gave every encouragement for hope.

Mr. ALLAN, in reply, said, when he undertook to read a paper on electro-magnetism as a motive power, he was aware that it was a venturesome task. He was aware of the amount of opposed theory that would be brought to bear against him; still he had laid his views before the meeting. He had told them at the outset that the matter was progressive—he might say, in its infancy—and he did not think, after having given a great amount of study and investigation to the subject, he had reason to be discouraged. He was not prepared to admit that the mechanical force of the electric current was no more than the heating power of the same current. His friend (Mr. Hearder) disagreed with him on the subject of the variation of the attraction as the squares of the distance. He did not say that was absolute, but it was dependent on the changes in what he would term the pole of the magnet. He had endeavoured to apply the forces in the most economical manner. The construction of the electro-magnet was a question in which there was a great deal still remaining to be done, and in the production of electricity it was impossible to predicate what might eventually be accomplished. He had merely taken the battery as he found it, and applied it to give power and motion to the machine. In the little engine before them the fault was that it did not produce within one-fifth the power it ought to do, owing simply to faulty construction, which could be got over in any machine hereafter to be made. The machine before the meeting had been tried at the Conservatoire des Arts et Metiers, Paris—not for the purpose of showing power at a small cost, but the principle of the application of the forces, for there were faults in the construction of the machine which changed the relative proportions to a great extent. It was the opinion, then, that the power would be best developed at a lower speed, and it was found upon calculation that the cost of working was 27 times that of steam. With regard to the battery power alluded to by Mr. Hawes, he had brought what was suitable for the purpose, but it did not follow that because the battery was of large dimensions, that therefore it was a battery of enormous consumption. He had found that the most economical way of working was to have a large reservoir of electricity, so to speak, so as to work a long time without the battery diminishing in power. The small model on the table had been kept at work for 10 days and nights without cessation, and without change of the

and using the same letters as before, we have

$$\frac{w' + ul'}{d' a'} \cdot l' \cdot v'.$$
 The spans and depths
 the same, $l = l' - d = d'$, and $a : w :: a' : w'$.
 Therefore $w' = \frac{w n l}{w + 2 n l}$. Applying this to the case

of the Menai tube; $w' = \frac{1553 \times 460}{1553 + 2 \times 460} = 289$ tons.

That is to say, a girder of 289 tons would possess the same effective strength as the Menai tube, which weighs 1,553 tons, if the material employed were twice the strength of iron.

The result, like that mentioned in my former letter, is sufficient to show the great importance of obtaining a more accurate knowledge of the new material—and it is especially important to ascertain, by testing numerous samples, whether the strength of puddled steel can be depended upon as an uniform result, and if not, to what degree of variation it is subject.

I am, &c.,

W. H. BARLOW.

Proceedings of Institutions.

LIVERPOOL.—On Tuesday evening, March 9th, a meeting was held of all the pupils of the evening schools, at the Collegiate Institution, the Rev. J. S. Howson, M.A., principal, in the chair. He introduced the Rev. Dr. Hume, Local Secretary of the Society of Arts, at Liverpool, who delivered an address, stating the nature and advantages of the Examination to be held in connection with the Society. A similar address had been delivered at the Liverpool Institute, at its annual meeting on the 20th of January, William Brown, Esq., M.P., in the chair. In both cases the thanks of the meeting were given to Dr. Hume for his full explanations. A Local Board has been formed to conduct the preliminary examination and superintend the subsequent one.

REDHILL.—The fourth annual report of the Institution for the last year records the continued progress of the society, and states that while the returns show double the number of subscribers to have withdrawn, as compared with last year, a much greater number has been added to the honorary as well as the ordinary list of members; and it is hoped that the advantages offered by an interchange of privilege with Reigate Institution, combined with other means now in progress and contemplation for general improvement, will excite and maintain a still greater interest in promoting the objects of the Institution. The number of subscribers at the present time is 170; 90 have been admitted during the year; 60 have left; leaving a net increase of 30. The number at the close of last year was 140. Two musical entertainments and sixteen lectures have been given during the year, seven gratuitous, and eleven at an expense to the Institution of nearly £32. The library now contains 597 volumes, of which 127 by gift and purchase have been added during the year. The number of each class of books issued during the year was as follows:—Educational, 118; Biographical, 59; Poetical, 64; Historical, 44; Miscellaneous, 333; Novels, &c., 504; making the total number, 1,122. Those of a light class, 504; and those of an instructive character, 618. The elementary class for writing and arithmetic, has been much better attended, and the discussion class has been recommenced. The class for instrumental music has given a lively interest to the Institution, and one has also recently been formed for vocal practice and instruction. The financial position of the Institution is favourable, and the Committee desire specially to acknowledge a donation of £10 10s. 0d., from W. Klein, Esq.; also £5 5s. 0d. from W. Hackblock, Esq., M.P.; this latter sum having been given for the purchase of books.

MOUSEUM.

On Monday, 1858, the visitors were on Tuesday, and Saturday, and Tuesday, free of admission on Wednesdays' days (admission on Wednesdays' evening, Wednes-

Correspondence.

PUDDLED STEEL.

In the 17th of March, in reference to the tensile strength is stated at 173,817 lbs., and in one sample 173,817 lbs., and a different quality of the material of 112,000 lbs. per inch, or strength of iron.

The relative weight of a girder of this quality, as compared with ordi-

[illegible]

...the ...

1. *What is the main purpose of the study?*
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Journal of the Society of Arts.

FRIDAY, APRIL 2, 1858.

EXAMINATION, 1858.

The Rev. Samuel Clark, M.A., F.R.G.S., Principal of the Training College, Battersea, has been elected Chairman of the Society of Arts' Board of Examiners.

The Rev. Bartholomew Price, M.A., F.R.S., Ecclesian Professor of Natural Philosophy, Oxford, has been appointed one of the Society's Mathematical Examiners.

CONVERSAZIONI.

The Council have arranged for two Conversazioni during the present session; the first on Saturday, the 24th April, at the Society's House, for which a card will be issued to each member; the second on Saturday, the 8th May, at the South Kensington Museum, the card for which will admit a member and two friends, ladies or gentlemen.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition will be opened on Monday next, the 5th instant.

The Exhibition will remain open every day until further notice, from 10 a.m. to 4 p.m., and is free to members and their friends. Members, by ticket, or written order bearing their signature, may admit any number of persons. A sheet of tickets for this purpose is issued to every member with this day's *Journal*.

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date:—

T. D. Acland, Member of Council.....	£ 5 5
John Ames.....	5 5
J. G. Appold, F.R.S., Auditor	10 10
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
M. D. Cunningham, R.N.	£1 1
C. Westworth Dilke, Vice-Pres. Chairman of Council (third donation).....	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffiths Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation).....	10 10
Seymour Haden (annual)	2 2
William Hawkerworth	1 1

Edward Highton (annual)	£ 2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.....	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Council (second donation).....	10 10
George Moffatt, M.P.	10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford.....	1 1
Charles Ratcliff, Hon. Local Sec. (annual)...	10 10
Joseph Skey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.....	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council (third donation).....	10 10

EXAMINATIONS.

The following letter has been received from the Royal Cork Institution:—

"Your favour of the 13th reached me, but several circumstances prevented my replying to you promptly.

"Accept my thanks for your specially calling attention to the Programme of the Examinations of the Society of Arts. It has happened, however, that hitherto no such plans or arrangements have existed here—at least for many years—as would have been suited to the preparation of candidates, and therefore any attempt in that direction would require longer time than the interval between the first notice we received and the time fixed for examinations.

Your estimate of the facilities afforded by the Library, the Athenæum, and the School of Design, is a correct one, but we have scarcely yet fully emerged from pecuniary difficulties respecting some of them, which have required all our attention.

I am fully determined to take steps for the preparation of candidates and the formation of a Local Board for next year, and through the press to prepare the public mind here for it. Although, then, I prefer not moving in it at all this year to moving imperfectly, I trust that Cork will be worthily represented on a future occasion.

I am, &c.,

NICHOLAS PETERSON,
Hon. Sec. and Treasurer.

SUPPLY OF COTTON.

The following letter, addressed to Mr Macgregor Laird, has been communicated to the *Journal* by Mr. Thomas Clegg:—

Manchester, March 18, 1858.

MY DEAR SIR,— * * * It is not necessary for me to reiterate what you must already have so often heard, but I may state that my operations in Africa were commenced some seven or eight years ago, with the view of putting down the slave trade by a new, but very simple method, viz., convincing the native African chiefs and others, that it was their interest to employ their people, instead of making war upon each other, for the sake of getting a colourable right or pretext for selling into slavery the prisoners taken in such marauding expeditions.

I commenced at Sierra Leone, and strongly recommended every one to begin to collect the cotton already growing, and cultivate more wherever it would grow...

The Church Missionary Society kindly recommended agents to conduct the business, and in every way aided my efforts with the very great influence they so deservedly possess.

The African Native Agency Committee, of London, kindly paid the agents their salaries, and the African Improvement Society, of Sierra Leone, put down a hydraulic packing press, made by Messrs. Bellhouse, of Manchester, to pack such cotton as these agents and others might be able to purchase. Not being able to collect more than about 235 lbs. of clean cotton during the first year, I found that Sierra Leone was not the right place at which to try the experiment, and at once decided to go direct to the interior cotton field, and to the residence of the chiefs about Abbeokuta.

In the mean time I discovered that all our European agents either died off, or had to return to this country, and another long process had to be gone through, by which several more years were almost lost. The Missionary Society kindly selected several young Africans, who came over to this country, at the expense of the Native Agency Committee, to be educated and instructed in the best method of cleaning the cotton without injury to the fibre. Two of these I had at my mill in the country for several years, where they also learnt to work as mechanics, carpenters, &c. A third I had in my office in town as clerk, book-keeper, &c. In the mean time another young African, who had been educated as a surgeon in England, took the matter up heartily, and conducted the various transactions until the two others from the mill returned to their own country. These three native African youths have since conducted the whole of my operations in a manner most creditable to themselves and to their country. The African Native Agency Committee, of London, liberally supplied several packing presses, a boat, weighing machines, cotton stores, and other heavy articles, whilst I supplied cotton gins, goods, and money to purchase the cotton with. Consul Campbell, of Lagos, seeing the great advantage likely to accrue to Africa from the energetic prosecution of the new trade, rendered every assistance, indeed he applied for, and has obtained leave from government, to come over to this country, and may be expected this spring to come down to Manchester, where I hope he will be my guest, with a view to further and promote these operations under the sanction of our government. Up to the 1st of this month, I had sent out 157 cotton gins costing from £3 17s 6d. to £10 10s. each. I have entered into correspondence with upwards of 76 natives, and other African traders, 21 or 22 of them being chiefs, many of whom have begun to consign their cotton, as well as other produce, to me; and I assure you it gives me the greatest pleasure to sell it for the highest price I can obtain, as well as to invest the money in any articles they may require, with the exception of spirits, or the implements of war. In conducting this affair, I have to venture, and have now outstanding about £4,693, every shilling of which I expect to receive back, indeed I have bills of lading and advices of great quantities of cotton and other produce being on its way to me now, both on consignment and in liquidation of what is owing to me. I have had one transaction with one of these traders, from which he received £3,500; and it is both satisfactory and pleasing to know that every trader, almost invariably, takes back hardware, earthenware, cotton goods, or other merchandise for the whole amount of cotton or other produce sent here. Owing to the extensive fires at Abbeokuta, I have not got quite so much cotton as I expected in 1857, but I have had cotton advices and bills of lading for shipments from Lagos up to the 28th of December as follows, viz:—

	Bales.		Bales
Per Candace	45	Per St. George	81
„ Gambia	10	„ Powerful	249
„ Invincible ...	34	„ Oscar	37
„ Token	36	„ Saltern Rock	245
„ Yarrow	41	„ Propeller	34
„ Gambia	116		

In the whole ... 929

Add to these, 17 tons burnt in the first fire, and 3,000lbs. to 4,000lbs. in the second, equal to 321 bales. Produced, or rather collected for sending to me, of usual size, 1,250 bales of African cotton; this quantity has therefore been purchased, and there has still always been plenty more offering on like terms, viz., 9d. per lb. in the seed. On this account the people of Abbeokuta cannot be made to believe that England can purchase all the cotton that they can produce, and yet Abbeokuta is but just on the border, at one corner, I may say, of the great cotton field of Western Africa, extending from Abbeokuta to the Niger and away into the interior.

Coupling my experience on this coast—the belief of the Abbeokutans, and the recent dispatch of Dr. Baikie from the Niger to our Government, where he states that the Rev. Mr. Clarke had seen at Ilas, near Ilorin, in the Yoruba country, fifteen or sixteen packages of clean cotton offered for sale, weighing 76lbs. to 80lbs. each—and had been assured by the natives that on market-days (every fourth) from 1,000 to 2,000 such bags were offered for sale, and this for their own country manufacture only—I say, coupling these statements with my operations, what I know of Tunis and Natal, and what Dr. Livingstone tells us of the East, I can clearly see a prospect of the slave trade being entirely starved out; the tractable, docile, and intelligent African, rising in the scale of civilization and Christianity, in proportion as he is allowed to enjoy his own rights, stay in, till the land, and trade in his own native country, even if confined to the cultivation of cotton alone.

You know much better than I do what Africa abundantly produces besides cotton, such as palm and other oils, arrowroot, ground nuts, ivory, Cayenne pepper, fruits, spices, gums, resins, dyes, dye woods, &c.

I should give a poor idea of the prospect of the cotton trade, by simply mentioning the commencement and recent operations connected with my own experiment, for, in all such cases, people first look on, and when they clearly see advantage, they also set to work; so it has been, and so I wish it to be, in Western Africa. One trader has ordered a good serviceable English canoe to convey the cotton, whilst he and another have ordered each a good new packing press, at considerable expense, and as there are now, at least, four presses ready for work, and the natives are able of themselves to turn out 10 bales daily from each press, they should turn out 40 daily, or upwards of 12,000 annually, with their present appliances. Three makers of cotton gins at Manchester, through my and various other instrumentality, have sent out to Africa the following, viz:—

	lbs.	lbs. Ds.
C. 24 gins, capable of cleaning 100 daily, say for safety 60...	2,120	2,120
D. 66 " " " 100 " "	6,600	6,600
J. 156 " " " 40 " "	6,240	6,240

250 gins, capable of continuously cleaning daily..... 14,000
lbs. of clean cotton, 4,368,000 lbs. yearly = 10,000 American or 40,000 African sized bales of cotton; and as all these gins have been bought, and, in most instances paid for on delivery, I believe they will not be allowed to be idle. This, I think, is a rare instance of rapid development of a particular trade, and the more so inasmuch as, in my case, every ounce of cotton has been collected, all the labour performed, and the responsibility of doing it borne by native Africans alone. I have many reasons for believing that the whole matter will prosper first, I believe it has God's blessing upon it; next, Africa is naturally adapted for growing cotton, as everywhere it springs spontaneously, and is indigenous to the country; next, because, wherever cotton will grow the people cry out for the African to come and help them to cultivate it, showing, in my opinion, that he is a natural cultivator also. Besides all this, I find that African cotton, whether from Quillimane on the north, Abbeokuta on the west, Tunis or Algeria on the north,

or Natal in the south, that this cotton is the best substitute for American cotton. Indeed, from whatever part of Africa it comes, in its natural state, it will invariably fetch in the Liverpool market from 2d. to 3d. per lb. more than East India cotton under similar circumstances. For some years this cotton has never cost more than 4d. per lb. in the seed, and at that price the agents, chiefs, and dealers, have never been able to buy up what has been offered, and this, I think, is a proof that it can be produced exceedingly cheaply, sufficiently so to compete with any other country.

It can be laid down in Liverpool, in all ordinary times, at about 4½d. per lb., viz., cost of it in the seed 4d.

4 lbs. to make one	2d.
Cleaning 30 to 40 lbs. for 4d., say	½
Packing and canvas	½
Carriage and charges on board	½
Freight to England (too much by half)	1
Charges in England	½
	4½

Recently, however, the Native Agency Committee have begun to charge those who use their gins and pack in their store 1d. per lb., and those who do this will be at a little more expense; but as the cotton is still worth 7d. in Liverpool, and not long ago was worth 9d., there is yet profit sufficient to encourage all natives to embark in the trade.

I believe first in the goodness of the cause, and next that to act entirely through the natives is the way, not only further to develop, but most certainly the most sure way of making it progressive and lasting. I have also a dread that if Europeans took up the cultivation of cotton, or dealing in the interior, it would in all probability result in the revival of slave labour, or merely in a spasmodic effort or two, and then a sickening off, a failure, and relinquishing the effort, after destroying in all probability the self reliance the native had formerly had.

On these grounds, then, I am anxious to raise at least £2,040 for four new cotton stations, and I hand you an estimate for them, which has been prepared by one who knows Africa and what is requisite much better than I do; it is as follows, viz:—

20 Gins £5	£100
Press	90
Weighing machine	20
Shed or native house	100
Wages for two natives one year	100
Capital to trade with	100
Or for each station	£510

I feel that I have not half done justice to this matter, and only regret that I have not been well enough, either to do it better now, or attend to it earlier. I must therefore supplement the statement by sending a few of my letters to the public papers, leaving you to deal with the whole in any manner most likely to redound to the benefit of Africa and this particular movement.

Yours, &c.,

THOMAS CLEGG.

McGee Laird, Esq.

SOUTH KENSINGTON MUSEUM.

During the week ending 27th March, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days, 4,048; on Monday and Tuesday, free evenings, 4,649. On the three Students' days (admission to the public 6d.), 1078; one Students' evening, Wednesday, 525. Total 10,298.

Home Correspondence.

ELECTRO-MOTIVE MACHINES.

Sir,—I was compelled to leave the interesting discussion on the 24th ult. before it terminated. I beg now, therefore, to make a few remarks with regard to the subject of our paper.

The cost of electro-motive machines has hitherto been compared with steam only; and those who have given their attention to the subject have done so only with the view of supplanting steam in railway travelling and navigation; but there are other purposes for which they might be used, viz., for working small machines, where steam could not conveniently be employed. Type-casting machines, sewing machines, churns, and, perhaps, ere long, bread may be made by machines, under the patent of Dr. Dangleish.

These machines are easily managed, take up less room, and are not so dangerous as steam-engines.

If they could be applied to type-machines alone, for every four worked thus there would be a saving of £7 10s. per week; from this would have to be deducted the cost of material, which would not be great, as but small power is required.

In conclusion, I would remark that Dr. Farraday not long ago, lamented how little was known of electricity; and why should these machines be condemned before more is known about them? I am, &c.,

J. F.

IRON STRUCTURES.

Sir,—The allusions made to the tubular bridge across the Menai Straits in Mr. Barlow's letter which appeared in the last number of the *Journal*, brings to my recollection a thought that occurred to me some time ago upon reading the result of the experiments which were tried for testing the power of that and other bridges to bear the passing over them of heavy trains.

The gentlemen acting under her Majesty's Commission of August 27, 1848, "to inquire into the conditions to be observed by engineers in the application of iron to structures exposed to violent concussions, vibrations, &c., constructed an apparatus by means of which a loaded car was allowed to run down an inclined plane, and along iron bars which were placed horizontally at the bottom." The car acquired a certain amount of velocity in descending the incline to the bars which were the subjects of the experiments. First of all a load of 1,120 lbs. was placed at rest upon a pair of iron bars, 9 feet long, 4 inches broad, 1½ inches deep, occasioning a deflection to the extent of six-tenths of an inch; it was then passed over the bars at the rate of ten miles an hour, whereby the deflection was increased to eight-tenths of an inch; and finally, at 30 miles per hour, when the deflection was as much as 1½ inches. Since the velocity so greatly increases the effect of a given load in deflecting the bars, it follows that a much less load will break the bar when it passes over it than when it is placed at rest upon it; and accordingly, in the example above selected, a weight of 4,160 lbs. is required to break the bars if applied at rest upon these centres; but a weight of 1,778 is sufficient to produce fracture if passed over them at the rate of 30 miles an hour. It also appeared that when the motion was given to the load, the points of greatest deflection, and still more of the greatest strains, did not remain in the centre of the bars, but were removed nearer to the remote extremity of the bar. The bars, when broken by a travelling load, were always fractured at points beyond their centres, and often broken into four or five pieces, thus indicating the great and unusual strains they had been subjected to.

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class department, so encouragingly referred to in the last report, has not, during the present year, displayed the same amount of healthy vigour. The writing class was but a short time in existence; and the class for arithmetic and mathematics could not be brought into operation for want of the requisite number of pupils. A similar attempt to establish a reading class likewise failed from the same cause. There is a German class and drawing class, but the students are not numerous. The Committee, in thanking those gentlemen who have kindly offered and given their assistance in this—one of the most important departments of the institution's operations—cannot but regret that their services have been so little appreciated and made use of by the members of the Institute. The Society of Art's Examinations, mentioned in the last report, were held at Huddersfield in June last. Only one member of this Institute (Mr. James Bower) attended, but the Committee have the satisfaction to state that he carried off a valuable prize in books, and obtained certificates in arithmetic, mensuration, geography, geometry, and algebra. The success which attended the Saturday Evening's Entertainments during the winter of 1856-7, and the practical good which it was hoped might arise from such an agreeable blending of instruction with amusement, induced the Committee to make a further effort in that direction. They regret to state that, although every exertion was made to render them attractive (keeping in view the object for which they were commenced) the proceeds did not on any occasion meet the expenses incurred. They were therefore discontinued. An excursion-trip to Ripon, Thimbleby, and Harrogate afforded a day's most delightful enjoyment and recreation to those who joined in it, and added to the Institution the sum of £1 16s. 3d. A *Concert* was held in December last. The whole of the provisions were provided gratuitously by the ladies, and the evening was altogether a successful one. From this source the sum of £13 was added to the funds of the Institute. The following lectures, during the session, have been delivered:—on "Paganism," by the Rev. Charles Cator, of Stokesley; on "Respiration," by J. R. Gibbs, Esq., of Northallerton; on "Shakespeare," by the Rev. Marmaduke Miller, of Manchester; on "The Idioties of London Streets," by Henry Mayhew, Esq., of London; on "Martin Luther," by George Dawson, Esq.; on "Beau Brummell," by George Dawson, Esq.; on "Pre-Raphaelitism in Poetry and Painting," by Mr. Gerald Massey; on "India," by Professor Partington; on "The Generation and Application of Steam," by Mr. John W. Hackworth; on "Burns and Love-Poetry," by Mr. Gerald Massey; on "Rare Old Chester," by Mr. B. Marsh. Seventy-five new books have been added to the library during the past year, by presentation and purchase. The total number of books belonging to the Institute is 2,504. The issue has been 10,276 against 9,890 in the preceding year, showing a decrease of 1,614. The Daily News Room continues to occupy a prominent place in the operations of the Institute, and is well supported. The attendance of members at the Reading-room has been equal to, if not greater than, that of any previous year. The present number of members is 495, of whom 3 are life members, 72 news-room, 100 yearly, and the remainder half-yearly and quarterly, showing a decrease of 8 on that of last year. The number entered in the books during the year has been 642. There is still the debt of upwards of £300 upon the building. The interest payable upon this sum necessarily cripples the operations of the Institute, especially in the purchase of new books.

PORTLAND BREAKWATER MECHANICS' INSTITUTE.—The second annual meeting of the members of this Institution took place on Friday last, the chair being occupied by the President, John Coope, Esq. The Secretary read the report. It appears that at the commencement of the present year the number of members on the books amounted to 108, the additions during the year

have been 40, and the withdrawals 27, leaving 121 members now on the rolls. The treasurer's statement of receipts and disbursements shows that, after defraying an expenditure of £109 1s. 3d. for books, concerts, lectures, rent, and salaries, there still remains a balance in hand of £5 3s. 11d., a result which is highly satisfactory considering the recent period of the formation of the Institution, and the necessarily heavy expenditure incurred in the purchase of a good library. During the year one hundred and ten volumes have been added to the library, and eleven lectures and two concerts have been given. The nightly attendance at the reading room has also been considerably in excess of last year. The great feature, however, in the report, is a proposal, on the part of the Committee, to reduce the entrance-fee and subscription to half the amount of the present charges. The entrance-fee of 2s. 6d. is to be reduced to 1s., and the annual subscription from 10s. to 5s. Although this will, in the first instance, diminish the Society's income, to a considerable amount, it is hoped that, ultimately, by the accession of new members, the present amount of receipts will not only be maintained but increased. Votes of thanks were passed to the Donors to the Institution, to Mr. J. G. Brown, the hon. Secretary, to Captain Joseph Cosens, and to the President.

MEETINGS FOR THE ENSUING WEEK.

- MON. Entomological, 8.
TUES. Pathological, 8.
 Photographic, 8.
WED. Society of Arts, 8. Dr. Odling, "On Some Points in the Chemistry of Bread making."
 Pharmaceutical, 8.
 Royal Soc. Lit., 8½.
THURS. Philological, 8.
FRI. United Service Inst., 3. Mr. J. Boucher, "The Comparative Merits of the Rifled Small Arms of England, France, and the United States, with remarks on the various modes of Grooving Rifle-barrels."
 Archæological Inst., 4.
 Astronomical, 8.
SAT. Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Part. No. *Delivered on 17th March, 1858.*
13. Metropolitan Drainage—Copies of Letters.
26. Metropolitan Drainage—Papers.
115. Ameer Ali Moored's Claim (Coffee's Petition)—Report from Committee.
118. Local Acts (1. Mersey Docks and Harbour (New Works); 2. Blyth Harbour and Dock; 3. London and South-Western Railway; 4. Exeter and Exmouth Railway; 5. St. Helen's Canal and Railway (Extension from Garston to Liverpool); 6. Shoreham, Hoveham, and Dorking Railway (Shoreham and Hoveham Line); 7. London, Brighton, and South Coast Railway; 8. South Wales Railway (New Railway, &c.); 9. South Wales Railway (Further Powers); 10. Liskeard and Looe Union Canal Company and Railway; 11. Wexford Harbour Embankment; 12. Plymouth Great Western Docks; 13. East Suffolk Railway (Capital and Branch Railway); 14. Chiswick Improvement; 15. Yar Bridge; 16. Formartine and Buchan Railway; 17. Aberdeen, Peterhead, and Fraserburgh Railway; 18. Calcutta Railway (Dalmahack Branch); 19. Burghhead Harbour (Extension and Improvement); 20. Corris, Machynlleth, and River Dovey Railway)—Admiralty Reports.
27. Bills—Commons Inclosure.
28. ——— Cambridge University Matriculation and Degrees.
29. ——— General Board of Health (Skipton, &c.)
30. ——— Militia Act Continuance.
Delivered on 18th March, 1858.
112. Kensington Gore Estate—Return (A corrected Copy).
113. Cape of Good Hope (Union Steam Navigation Company)—Return.
113. Harbour, &c., Bills (16. Sunderland Dock)—Board of Trade Report.
117. Railway and Canal Bills (15. Aberdeen, Peterhead, and Fraserburgh Railway; 16. Border Counties Railway Extension; 17. Brentford and Richmond Railway; 18. Chester and Holyhead Railway; 19. Cornwall Railway; 20. Cromford and High Peak Railway; 21. Darent Valley Railway; 22. East Kent Railway (Dover Extension); 23. East Kent Railway (West—

Experiments were made on the Croydon and Epsom line and the South Eastern line, and at the same load in motion, the former produced one-seventh more power than the latter, which was at rest.

Similar experiments with a tubular bridge by the G. O. 1850. A train of 28 wagons, 280 tons of coal, was drawn across the bridge, and the deflection was ascertained. The same train was then moved to the distance of 100 ft. from the tube at the highest speed, and the deflection was sensibly less.

It will be observed that the tubular and open briquette is less than the latter for the reason that the defect upon whether the air bodies are constantly bulk. They are in position.

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1903. M. A. F. Newman.
1904. M. A. F. Newman.
1905. W. F. Newman.
2. J. Murphy.
16. J. Looming and J. C. Ba-
don.
139. Sir Henry Stansp.
103. D. Williams.

Journal of the Society of Arts.

FRIDAY, APRIL 9, 1858.

CONVERSAZIONI.

The Council have arranged for two Conversazioni during the present session; the first on Saturday, the 24th April, at the Society's House, the card for which will admit the member only; the second on Saturday, the 8th May, at the South Kensington Museum, the card for which will admit the member and two friends, ladies or gentlemen. The cards for each of these evenings have been issued this day. Members not receiving them are requested to communicate with the Secretary of the Society of Arts.

Members of Institutions in Union who are anxious to attend either of these Conversazioni, are requested to apply to the Secretary of the Society of Arts, through the Secretary of the institution to which they belong.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition was opened on Monday last, the 5th instant.

The Exhibition will remain open every day until further notice, from 10 a.m. to 4 p.m., and is free to members and their friends. Members, by ticket, or written order bearing their signature, may admit any number of persons.

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date :—

T. D. Acland, Member of Council.....	£ 5 5
John Ames.....	5 5
J. G. Appold, F.R.S., Auditor	10 10
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
H. D. Cunningham, R.N.	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation).....	10 10
F. Seymour Haden (annual)	2 2
William Hawkworth	1 1
Edward Highton (annual)	£ 2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.....	20 0

George Lowe, F.R.S.	£1 1
The Master of the Mint, Member of Council (second donation).....	10 10
George Moffatt, M.P.	10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford.....	1 1
Charles Ratcliff, Hon. Local Sec. (annual)...	10 10
Joseph Skey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.....	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council } (third donation).....	10 10

LOCAL BOARDS—PREVIOUS EXAMINATION.

Forty-seven Local Boards have been formed. Returns of the Candidates who have passed the Previous Examination have been received up to the 7th inst., as follows :—

Leeds	4
Wigan	6
West Hartlepool.....	3
Leeds Christian Institute, No. 1.....	14
Northwram	1
Portsmouth	2
Warminster.....	1
Banbury	2
Macclesfield.....	83
Newcastle-on-Tyne	3
Lymington	1

THE MULREADY DRAWINGS.

Previous to the presentation of these drawings to the National Gallery,* photographic copies of them were taken by Mr. Thurston Thompson, at the request of the Council. Mr. Thompson has arranged to supply copies to members of the Society, the price being seven shillings and sixpence for the set of three. Members desiring to have copies should communicate with Mr. Thurston Thompson, at the department of Science and Art, South Kensington, S.W.

SEVENTEENTH ORDINARY MEETING.

WEDNESDAY, APRIL 7, 1858.

The Seventeenth Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 7th inst., Dr. Frankland, F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Blakeley, Capt. Alex. Theo-	Smith, Thos. Roger.
philus, R.A.	Symonds, Frederick.
Hobbs, William Fisher.	Vyvyan, Richard Henry
Seymour, Hon. F.	Stackhouse.

The following Institution has been taken into Union since the last announcement :—

Dorking Literary and Scientific Institution.

* See the present volume of the *Journal*, p. 237

Extension); 24. East Scotland
Lowestoft and Beccles Commu-
burgh and Glasgow, and
26. Inverary and Old Man
Knighon Railway)—Board of Trade.

Delivered on 20th

117. Railway and Canal Bills (25-1).
Coast Railway (Capital); 26. South
South Coast Railway (Shore-
chester, Sheffield, and Lin-
stall); 31. Metropolitan Rail-
taking, &c.); 32. Mid Kent
33. North British Railway
Valley Railway (Extension)
Railway (Dartford, New
and Buntingford Railway;
Andover Canal; 39. Ayr and
Bognor Railway; 41. Carlisle
Carlisle Railway); 42. Carlisle
way; 43. Corris, Machyn-
Devon Valley Railway; 44.
Railway; 46. Eastern Counties
Railway; 48. Exeter and
Kinross and Kinross-shire
Buchan Railway; 51. I.
52. North British Railway
53. Redditch Railway; 54.
Railway; 55. Stokes Bay
and Lancaster Railway; 56.
Railway)—Board of Trade.
Ecclesiastical Commissioners
Church Estates—7th Gen.

Delivered on 20th

135. Greenwich Hospital—Copy
138. Committee of Selection—
126. Militia—Return.
129. East India (Castes of Hind
134. Superintendents of Naval
117. Railway and Canal Bills (25-1).
Junction, and Hertford
panies Amalgamation; 59.
Mary Cray); 60. Sh.
South-Eastern Railway
St. Mary Cray); 62. S.
way; 63. Stockport;
64. Stockton and Dar-
panies Amalgamation
(Durham Lines); 66. S.
Riding Lines); 67. W.
Norwood Junction R.
London and Crystal P-
tion Railway)—Board
31. Bills—Medical Profess
32. —Galway Free
Civil Service—3rd Re-

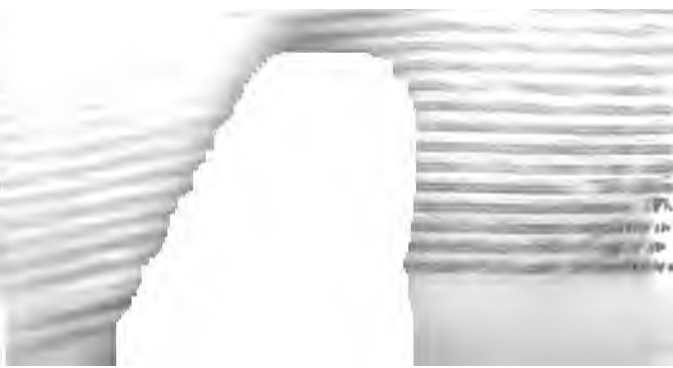
PATENT LAW

APPLICATIONS FOR PATENTS

[From Gazette]

Patent

259. C. Johnson, Dickle-
worth—Improved
different operat-
1
378. S. Middleton, 5, L-
uniting or seam-
connected there-
1
390. D. Nurse, R. N-
Imp. in coat-
therewith.
D
433. S. Boulton, 11, L-
taining by an-
terials used in-
1
444. J. N. Hearder, 1-
448. G. Davies, 1, S-
lead, either as-
metals. (A s-
450. R. S. Bartlett,
papers, envel-
462. Comte C. Catal-
nufacture of
454. R. A. Broom-
of skirts and
466. A. Whytock, C-
lane—Imp. in
them in trav-
458. J. W. Clark, S-
retarding rate
municating
462. C. Sanderson,
iron and st-



ices, vegetable and animal albumen, resemble one another very closely in constitution and properties. But the principal components of the extractive are the two closely allied substances, dextrine and sugar. Now, these substances are capable of being formed from starch, and, in flour, or even in the entire grain, we can, by various processes, transform the starch, first into dextrine, then into sugar. Starch is an organised substance, and may, not improbably, have been originally formed from the seed out of some saccharine juice—sugar being lower than starch as an organic product. But, in grain and flour, we can only regard the sugar as being formed from a reverse process, namely, from the dextrine of starch. We find that wheat-grain, when in good condition, and also most samples of wheat flour, contain any sugar whatever, although sugar is only formed in them by the action of water. Starch always acquires a feebly acid reaction, possibly to lactic acid, or super-phosphate of lime, and the reason of this acidity, to effect a transformation of starch. If the flour be extracted with lime water, or alcohol, this difficulty is obviated, and we are enabled to ascertain whether the sugar present in the flour or is a product of the action of water. From my own experiments I am inclined to think that the existence of pre-formed sugar in flour is rare. I have here appended some analyses of flour.

	No. I.	No. II.	No. III.	No. IV.
.....	9.30	10.05	11.81	4.99
.....	66.55	64.58	62.52	61.21
.....	7.47	8.45	12.05	18.23
.....	14.66	15.50	12.85	15.96

No. I. and II. are fine well-conditioned flours; No. III. is cheap inferior flour; No. IV., a very much inferior flour.

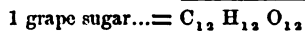
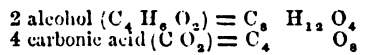
Very lately it was considered by scientific men that the high quality of the flour was dependent upon the amount of gluten or flesh-forming material that it contained. But it is now perfectly certain that the value of flour, and its price in the market, depend not so much upon the amount of gluten but upon the amount of starch. The finest quality of flour, that is, the flour of the centre of the grain, is always poorest in gluten constituents. Hitherto starch has been the basis of excellence; gluten, the physiologists; Lawes and Gilbert have maintained, with good reason, that the baker's criterion of excellence is physiologically correct; or, in other words, that bread as food depends more upon its heat-value than its flesh-forming function. With regard to the quality of the flour, I think I may safely say that they are proportionate to the good condition of the flour, and are confirmed by the above analyses. A high percentage of extractives nearly always indicates some defect in the harvesting or storing of the grain or flour. The manufacture of bread from flour, it is usual to say, is for the purpose of generating, within the dough, thousands of minute gas bubbles, which, when the resulting loaf may prove not a hard, starchy mass, according to its degree of softness, vesicular and easily digestible sub-stantially, leaven or stale dough was used as the leaven. For many years past the yeast of beer has been commonly employed as a substitute, or rather as a substitute. Yeast is glutinous matter in a state which is in a state of change it imparts to the flour or dough. Independently of any other action, the gluten of dough can, in course of time, transform itself into this particular transformative condition, which constitutes leaven. But in the process, *per se*, the dough simultaneously acquires its taste and smell. Now, the panary

fermentation consists essentially in the mutual reaction of sugar, and of gluten in a particular state of change. The gluten of yeast and leaven is in this particular state of change, and by mere contact with one or other of these substances the gluten of fresh dough readily acquires a similar state. Hence, one great use of the yeast or leaven is to put the gluten of fresh dough into an active condition, whereby it may exert a transformative or fermentative action upon the sugar. In order to effect the necessary fermentation of the sugar, some bakers rely largely upon the gluten of yeast, but in Paris, more particularly, where bread-baking has arrived at a high state of perfection, it is customary to rely chiefly upon the gluten of the dough, and only to facilitate the action by means of yeast.

We have now to consider the nature of the change which the active gluten of the dough or yeast effects upon the sugar. Grape sugar or glucose is a body having of itself very little tendency to change. It consists of carbon, hydrogen, and oxygen, and is represented by the formula $C_{12}H_{12}O_{12}$. The following table shows also the composition of several allied substances:—

Cane sugar ...	$C_{12}H_{22}O_{11}$ or $C_{12}H_{11}O_{11}$
Grape sugar ...	$C_{12}H_{12}O_{12} + 2H_2O$
Fruit sugar ...	$C_{12}H_{11}O_{11}$
Milk sugar ...	$C_{12}H_{10}O_{10} + 2H_2O$
Starch	$C_{12}H_{10}O_{10}$
Dextrine	
Leucosaccharine	
Gum	
Woody fibre	

But the nitrogenised bodies usually classed as proteine compounds, such, for instance, as fibrin, gluten, albumen, and casein, are remarkable for the facility with which they undergo certain spontaneous changes of decomposition, and these proteine compounds, when in this state of change, are, by mere contact, capable of affecting the condition not only of fresh nitrogenous compounds, but also of grape sugar and other varieties of non-nitrogenous organic matter. The changes induced upon this last description of bodies vary with the nature of the nitrogenised substance employed, and with its degree of decomposition. Thus, stale casein or curd converts sugar first into lactic acid, and eventually into carbonic acid and butyric acid. The active gluten of yeast or leaven converts sugar into alcohol and carbonic acid, as represented in the following diagram:—



Pure sugar can in this way be resolved completely into carbonic acid gas and alcohol. The object of the baker in the use of yeast or leaven, is to effect this resolution or fermentation of the saccharine constituents of the wheat within the substance of the dough. A certain quantity of flour is mixed with yeast, salt, and tepid water. This constitutes the sponge, which is covered up and set aside in a warm place to undergo fermentation. In the course of an hour or so the mass swells up considerably from the generation within its substance of carbonic acid gas, large bubbles of which gradually extend to the surface and burst. With each successive burst we have a sudden falling of the sponge, followed by a gradual rising, and these alternate actions would, if allowed, continue to take place for many hours. Various other modes of making an active sponge are employed, particularly by the use of potatoes. When the sponge, no matter how formed, is in an efficient condition, the baker mixes up with it fresh portions of flour, salt, and water, which added quantities constitute the great mass of the dough. The whole is then subjected to a thorough kneading, so that the fermenting dough may permeate and affect the entire substance, and thus cause an equable liberation

very nearly identical, with ordinary diastase. He shows clearly that the brown colour of bread made with pollard or fine bran, is not due to the particles of bran, but to the circumstance of the cerealia effecting a conversion of the starch into dextrine or sugar. When this conversion was prevented by means presently to be described, the bran bread had a very pale orange colour, quite different to that of ordinary brown bread made by the usual method. The crumb of the bread was coloured yellow, merely by the small particles of bran disseminated through the mass.

In confirmation of M. Mage Mouries' views, a fact is recorded by Chevreul, in his report on the subject, to the effect that "a method was proposed to the French government, by means of which the whole of the flour in wheat was to be converted into white bread. This method consisted in removing the coloured skin of the grain, and it was supposed, in accordance with the prevailing opinion, that when all the coloured portions of the grain were separated, the bread obtained would be white. This method was tried, and, to the astonishment of all parties, the bread obtained was brown." The whiteness of bread does not depend solely upon the whiteness of the flour, but in great measure upon the little degree of change which the starch undergoes in baking. I have taken the finest flour, which in the ordinary way yielded unexceptionable bread, and have had it kneaded with infusions of bran and malt instead of water. The resulting loaves have corresponded exactly with those made from sprouted wheat in being brown, sticky, sweet, and scarcely eatable, owing to the conversion of the white starch into a brown sticky mixture of dextrine and sugar. In bread of good quality, the starch has undergone very little alteration. A portion of it is rendered soluble in water, but the great majority of the granules are simply swollen, not burst, and may be washed out of the bread, collected, and weighed. Vogel gives the following analysis of a wheat bread loaf:—

Sugar	3.6
Altered starch.....	18.0
Unaltered starch.....	53.5
Gluten, with some starch	20.7
	95.8

I have never estimated the amount of unaltered starch in bread, but I have frequently collected it and examined it microscopically.

Between the most perfect flours and such sprouted specimens as cannot of themselves be manufactured into a saleable bread, we have innumerable intermediate varieties. Now, it is not by any means certain that the glucogenic varieties of flour are of necessity inferior to the finest flour in their nutritive and digestive properties. There is reason to believe that all starch in its passage through the alimentary canal becomes converted into glucose or an allied substance; and there is no reason to believe that the commencement of this change out of the body is in any degree objectionable. But these flours, in proportion to their glucogenic tendencies, do not make good bread, and it becomes an object with the baker to oppose the glucogenesis as much as possible. Hence, in making bread from certain kinds of flour, he finds it necessary to add alum, or lime, or bean-meal, or some corrective substance which, from experience, he knows will cause the flour to yield a loaf presentable to the eye and agreeable to the palate. In reference to the so called adulteration of bread with alum, I need scarcely remind the members of the Society of Arts that they are not required to believe everything they have heard from the lips of gentlemen who, gasping for notoriety, have raised a popular clamour on the subject, have ascribed to themselves exclusive knowledge, and claimed for themselves instinctive infallibility. On scarcely any topic, perhaps, has there been expended so much bad

chemistry, loose speculation, and, I fear, groundless defamation, as upon that of alum in bread. One gentleman, who, from his vast knowledge, felt himself impelled to write a book on the subject, describes in great detail not only how he found alum in bread, but also how he ascertained the quantity, and that by a process which could not possibly have yielded him a single particle. Another gentleman, probably of greater knowledge, inasmuch as he was impelled to write two books instead of one, disclaims altogether the process above alluded to, but bolsters up his own demands on public credulity by quoting the monstrous results obtained by its means. His predecessor, when he wished to weigh alumina, weighed a something or other without any alumina whatever; but he, more wise in his generation, does not omit the alumina, but takes care to weigh it with a good deal of something else in addition. When in a court of law a scientific witness affirms that he has detected arsenic, he is required to show that the results he obtained could not be due to any other substance than arsenic. But the alum detector of the present day contents himself with getting a whitish precipitate, which may be alumina or may be something else. Why should he trouble himself about a baker's reputation? The means for detecting and estimating alumina are of course equally certain with those for detecting and estimating arsenic; but I know of no book, devoted to food adulteration, in which a satisfactory process is given, though I admit that, in some of these books, the processes are so loosely described as to leave the authors a loophole of escape from the charge of positive error.

In illustration of the above statement, I beg to direct your attention to the following table, which exhibits the results of an examination of wheat grain and other vegetable produce.

	Number of Samples Examined.	Grains of ash used.	Precipitates formed.
Wheat.....	23	49 to 100	10
Bran	1	25	1
Maize	1	52.1	0
Barley	3	50	0
Wheat Straw	6	100	6
Barley Straw	3	100	0
Mangold-wurtzel bulb ...	2	100	0
Swede Turnip bulb	3	50	0
Swede Turnip leaf	4	25 to 54	4

The ashes were all kindly furnished me by Dr. Gilbert. The incinerations were made at the Rothamstead laboratory, and all who are acquainted with that laboratory must acknowledge the great care with which every operation is there conducted.

My object was to ascertain whether the process usually recommended for the detection of alum in bread, would not also detect alum in wheat grain and other vegetable produce that could not possibly be adulterated. The process I adopted is that known as Kuhlmann's, which is described as follows: I quote from Mitchell's "Treatise on the Falsifications of Food." "Incinerate about half a pound (3,500 grains) of bread in a crucible, and after having pulverised the ash, treat it with nitric acid. Evaporate the mixture nearly to dryness, dilute with about half an ounce of water (distilled), and add to the whole an excess of caustic potash solution; boil and filter; neutralise the filtered liquid with hydrochloric acid, and add a slight excess of ammonia. Collect the alumina thus precipitated in a filter, wash, dry, ignite, and weigh it. Every 100 grains of alumina correspond to about 467 grains of alum." Now, this is the process I adopted in my examination of the above ashes, save that in many cases I employed hydrochloric instead of nitric acid, such being, I believe, the usual practice, and what was the result? Why, out of 46 examinations I obtained in 21 instances the celebrated white precipitate, said to

be indicative of alumina and alum; so that had these samples been in a manufactured instead of the natural state, had the wheat, for instance, been made into flour, I should have been justified, according to the authority quoted, in pronouncing it to be adulterated with alum. But a subsequent examination of the precipitates I obtained, shewed that in reality they were not due to alumina at all. M. Kuhlmann's process, as above described, is possessed of rare merits. It will never fail in detecting alumina when present, and will often succeed in detecting it when absent also. The idea of weighing this *olla podrida* of a precipitate, and from its weight calculating the amount of alum present, as is gravely recommended by great anti-adulteration adepts, is too preposterous to require a moment's refutation.

Last year, a London physician wrote a letter to the *Lancet*, wherein he stated he had found nearly an ounce and a half of alum in a 4lb. loaf obtained from a very noted baker, being at the rate of 8lbs. of alum to a sack of flour; and yet the ash of this bread amounted only to 1·17 per cent., including more than 0·5 per cent. of common salt. The ash of 500 grains of bread, in which 11·37 grains of alum were detected, yielded him only 1·4 grains of sulphate of baryta, though every chemist knows it ought to have yielded more than 11 grains, inasmuch as a grain of alum furnishes very nearly a grain of sulphate of baryta; and the presence of so much common salt, of course negatives the notion that sulphuric acid had been expelled to any great extent by the incineration.

If we have had curious methods described for the detection of alum, we have also had curious statements as to the chemical effects which it produces. About twelve months ago, a very ingenious friend of mine published a report on the subject of alum in bread, and a still more ingenious gentleman so highly approved of it, that he caused the major part to be published in divers newspapers, with his own name appended at the bottom in the large capitals usually considered indicative of authorship. Well, in each of these Siamese-twin reports—for the second had no separate individuality—we have the following daringly-imaginative explanation of the effect of alum in panification:—"The chemical action of alum on moistened flour is analogous to tanning, and destroys (*pro tanto*) a considerable portion of its nutritiveness by converting it into a kind of wash-leather, or spongy India-rubber. This gives it a tenacity, or toughness and firmness, enabling it to retain the thousands of little bubbles (given off by the yeast) which constitute the lightness or sponginess of the bread." I should have much liked to have shown the members of the Society of Arts some of this wonderful spongy, India-rubber, wash-leather gluten, which two gentlemen, unknown to one another, were clever enough to obtain from alumed bread. Unfortunately, however, my own experiments for its preparation were not crowned with success.

Now, from actual experiment, not from speculation, I think myself justified in saying that one very important use of alum is to prevent any undue deterioration of the starch during the process of raising and baking. If we mix a solution of starch with infusion of malt, in the course of a few minutes only the starch can be no longer detected, being completely converted into dextrine and sugar; but the addition of a very small quantity of alum either prevents altogether, or greatly retards, the transformation. The action of diastase upon undissolved starch is very gradual, but here also the interference of the alum is easily recognizable. Bread made with infusion of bran or infusion of malt is very sweet, sodden, brown-coloured, and so sticky as almost to bind the jaws together during its mastication. But the addition of alum to the dough causes the loaves to be white, dry, elastic, crumbly, and unobjectionable, both as to taste and appearance. I have found that flour, which of itself was so glucogenic as to yield bread undistinguishable from that made with infusion of malt, could, by the addition of alum, be made to furnish a white, dry, crumbly,

eatable loaf. Dr. Hillier, if present, will probably remember my sending him two loaves made from a sample of glucogenic flour with which he had supplied me; the one, without alum, being brown, wet, sweet, and sticky; the other, with alum, being white, dry, crumbly, and unobjectionable. The specimens on the table exhibit the same differences in appearance. Of course, the worse the character of the bread which the flour yields *per se*, the more striking the effect of the alum. Now, that alum does oppose the transformation of starch into sugar during the process of bread-making, is indisputable; and this action is quite sufficient to account for the whiteness, the dryness, and the non-adhesiveness that result from its employment.

Alum is said to have the power of causing bread to retain a larger proportion of water than it otherwise would. Thus, one witness, before the Select Parliamentary Committee on the Adulteration of Food, said, "supposing it could be proved that the presence of alum in bread is not directly injurious to health in any way, yet certain objections would still remain to the employment of alum. One of those objections is, that it causes the bread to hold more water than it would otherwise do, and, of course, the greater the quantity of water the less the quantity of wheat flour." And another witness said that "bakers who used alum defrauded their customers by selling water at the price of bread." These statements certainly do not accord with my experience. I once examined the new crumb of eighteen alumed loaves, and found as a mean result 43·68 per cent. of water. I also examined, in a precisely similar manner, the crumb of seven non-alumed loaves, and found as a mean result 42·78 per cent. of water, the difference being quite insignificant as compared with the differences which subsist between the individual loaves, whether alumed or not.

The table, given on the next page, shows the detailed results. The specimens marked with asterisks did not contain alum. The table also gives the per centages of nitrogen and ash. The loaves were all two-pound loaves, obtained new, that is to say, during the day on which they were baked. The top crust of each loaf was sliced off, and then a layer, about two inches thick, removed, trimmed at the edges, and submitted at once to examination. My estimations of water accord closely with those of Paye and Johnston, but are somewhat higher than those of Lawes and Gilbert, of MacLagan, and of Christie. The mean of my nitrogen determinations corresponds closely with the results of Lawes and Gilbert, MacLagan, Playfair, and Payen.

Another reputed effect of alum is to prevent the loaves turning sour or mouldy. On this point I have no experience to lay before the Society. M. M. Mouries lays considerable stress upon the fact that when the fermentative action of the gluten preponderates, we have sugar converted into carbonic acid and alcohol, as is desirable; but that when the fermentative action of cerealin, and, I would add, of diastase, preponderates, we have starch converted into dextrine, sugar, and lactic acid, as is most undesirable. We should infer chemically that alum, by preventing the transformation of starch, would prevent or interfere with the production of lactic acid, which seems to be produced in recognisable quantity when bread is made from inferior flour. Some of my friends, who make their own bread, have informed me that alum is necessary to prevent mouldiness, and evidence to the same effect was given before the Parliamentary Committee. We know that alum is usually added to flour paste to make it keep, but whether its preservative power depends upon its preventing the paste from liquefying by an alteration of its starch, or merely upon its preventing mouldiness, I am unable to say.

Liebig's explanation of the effect of alum in panification, corresponds as far as it goes with that which I have had the honour of presenting to your notice. Liebig says that in damp flour there is produced, by a re-action

of the gluten and starch, acetic and lactic acids, which render the gluten soluble in water, and that alum and

	Price in Pence.	Per centage of Water.	Per centage of organic matter.	Per centage of mineral matter or ash.	Per centage of ash in dry bread.	Per centage of Nitrogen in new bread.	Per centage of Nitrogen in dry bread.
1	43	43.03	55.48	1.49	2.61	1.83	3.21
2	39	42.86	56.07	1.07	1.87	1.47	2.57
3	39	44.81	53.74	1.46	2.62	1.89	3.42
4	39	46.71	52.12	1.17	2.19	1.14	2.13
5	4	45.42	53.24	1.34	2.46	1.66	3.05
6	4	44.33	54.29	1.38	2.47	1.04	1.88
7*	4	44.41	54.38	1.21	2.17	1.06	1.90
8	33	38.62	59.79	1.59	2.58	1.15	1.47
9*	32	42.77	56.00	1.23	2.15	1.31	2.29
10	4	48.67	55.09	1.24	2.20	0.93	1.66
11*	41	42.94	55.82	1.24	2.17	1.12	1.95
12	31	44.20	54.61	1.19	2.13	1.14	2.05
13	4	45.12	53.55	1.33	2.4	1.17	2.15
14	31	44.34	54.41	1.26	2.28	1.23	2.21
15	4	43.70	55.07	1.23	2.18	1.01	1.81
16	43	43.06	55.59	1.35	2.39	2.24	2.13
17	4	43.90	54.92	1.18	2.11	1.13	2.03
18	4	42.12	56.65	1.23	2.12	1.23	2.14
19	43	42.58	55.99	1.43	2.50	1.34	2.34
20*	43	41.06	57.23	1.71	2.90	1.39	2.33
21*	43	44.07	54.67	1.26	2.26	1.08	1.98
22	4	44.46	54.22	1.32	2.38	1.18	2.14
23	43	43.43	55.24	1.33	2.36	1.19	2.10
24*	43	42.89	55.68	1.43	2.52	1.17	2.05
25*	4	41.34	57.76	0.90	1.54	1.33	2.27
Mean.	4	1085.84	1381.61	32.55	57.57	31.53	55.72
		43.43	55.26	1.30	2.30	1.26	2.22

other mineral salts render this gluten again insoluble. Although Liebig referred specially to the dissolved gluten, I have no doubt he really meant to include all the dissolved proteins or albuminoid substances, including, of course, the diastase and cerealins. But he does not seem to have deduced, or, at any rate, he has not referred to the consequence which would necessarily arise from this action, namely, the prevention of the metamorphosis of the starch during baking. Payen seems to entertain the same idea as Liebig. He says that "when wheat has been badly kept, or when the moist flour has become altered during its warehousing or transport, from three to six thousandths of alum are occasionally added, so as, in some degree, to restore to the gluten the consistency that it has lost." In the absence of any evidence, either from fair inference or direct observation, that the introduction of small quantities of alum into bread is prejudicial to health, it seems that the practice is not so reprehensible as is usually maintained. It certainly improves greatly the quality of bread made from inferior flour, and, in a politico-economical point of view, is important, inasmuch as it renders a large quantity of flour suitable for human food in the form of bread, which flour would otherwise have to be devoted to less important uses.

Another chemical agent, namely, lime-water, has been recommended, to effect the same result as that now accomplished by means of alum. This substance was originally recommended by Liebig, and has been used, I believe, to a considerable extent by the Glasgow bakers. Now, I would seriously advise London bakers to give lime-water a full and fair trial. Of course they know exactly how to use alum, and they would have to learn by experience how to use lime. Hence, if their earlier trials are not completely successful, they should, nevertheless, persevere. From laboratory experiments I find that lime water acts quite as efficaciously as alum in

preventing the action of diastase, and the consequent transformation of starch into sugar. It seems to have scarcely any action upon the fermentation induced by yeast, or, at any rate, a much less action than alum, which, undoubtedly, retards the process somewhat. It yields a very white agreeable bread, having a rather more porous texture than ordinary bakers' loaves, and being quite free from any sourness of taste or smell. The acidity of dough, independently of its obvious disadvantages, facilitates greatly the deterioration of the starch. Starch is always converted into dextrine by a sufficient elevation of temperature—about 320 deg. Fahr., and hence, the crust of bread usually contains as much dextrine as starch. But the presence of a small quantity of free acid enables the transformation to be effected at a lower temperature, and two processes are now followed for the manufacture of dextrine upon this principle—that of M. Payen, who uses nitric acid, and that of Mr. Crace Calvert, who uses sour butter-milk, the acidity of which is probably due to the same substance as is that of dough, namely, to lactic acid. While strongly recommending the use of lime-water, I yet fear that, in the practical operations of the bakery, it will prove not quite so effectual as alum in improving very inferior flour, and chiefly because it will not be possible to introduce so large a quantity into a loaf, inasmuch as a pint of water can only dissolve about 12 grains of lime. Of course, the use of lime-water will constitute an adulteration, and be stigmatized as highly immoral, inasmuch as it will enable the baker to improve the appearance of an inferior flour. Moreover, although recommended by Liebig, it will render the phosphates insoluble, and so be open to another whimsical objection. But the detection of this adulteration with lime will, I conceive, be more of a puzzle to those gentlemen who have played with the alum-question, and who have not thought it immoral to palm off their bad chemistry as a very superior article. There are, doubtless, many other mineral salts that have the same kind of action as alum, though different in degree. Thus, sulphate of copper seems to act very powerfully. I have found the addition of sulphate of zinc to yield a very white loaf; and even gypsum is not altogether without effect. An admixture of bean meal is said to exert the same action on the flour of badly-harvested wheat, as is exerted by alum. Dr. Gilbert informs me that such is really the case, but it is a point on which I have no personal experience. M. Mège Mouries, in his new process of bread-making, whereby all the meal of wheat is to be converted into wheat bread, effects the neutralisation of the cerealins by fermenting the brown meal with water in which sugar and yeast have been subjected to the alcoholic fermentation. This process prevents wholly, or to a great extent, the lactic acid fermentation that would otherwise be induced by the cerealins, and it also makes the bran to be thoroughly separated from the meal adhering to it. Then the white flour is kneaded with the fermented liquid which contains the sediment of flour separated from the bran, so as to produce a mass of dough which represents the whole farinaceous portion of the wheat. By the process of M. Mège Mouries, the deterioration of the starch is said to be prevented, and the yield of white bread from a given weight of wheat largely increased, inasmuch as the whole of the wheat is eventually separated into two products only, namely, the coarse-bran, and the fine bread. The processes are fully described in the *Compte Rendus*, for January 12th, 1867, and a very excellent abstract was published in the *Pharmaceutical Journal*, for November 1867. And now, in conclusion, I have only to thank you for your kind attention, and to express a hope that I have succeeded in rendering a common-place subject not wholly uninteresting or uninteresting.

DISCUSSION.

The CHAIRMAN said they must all have felt, whilst

listening to the admirable paper of Dr. Odling, that he had introduced a most important subject, in which they were all, more or less, directly interested. It was one which, within the last few years, had engaged the attention of many scientific men, and with very different results. There was much difference of opinion as to the latter point touched upon by Dr. Odling, namely, the adulteration of bread, as well as on the changes which took place in the process of bread-making. He saw a number of gentlemen present who were acquainted with the subject, and he hoped, as this was a favourable opportunity, the subject would be fully discussed, so that those who had held that adulteration of bread had been practised to a dangerous extent, might, if this opinion were shown to be unfounded, be relieved from further anxiety on the subject, and also that those who had held that such adulteration had not been extensively practised, might, if this were proved to be an error, be put upon their guard upon learning that considerable adulteration had taken place.

Dr. NORMANDY had listened with considerable interest to the clever and entertaining paper of Dr. Odling. He would address himself to the question of the adulteration of bread with alum, and he would first of all speak of the process which chemists, who knew what they were about, adopted as a test of the presence of alum in bread. It was not a process of his own contrivance, but that suggested by Kuhlmann, and which he (Dr. Normandy) had slightly modified. In his opinion that process, thus modified, was the only one which could be relied upon for the detection of alum. He would recite the process of Kuhlmann, and also mention the modifications which he conceived necessary to give unexceptional results. The process which he followed was this:—He took 1,500 grains of bread from the middle of a loaf, cutting off the crust—not that it was strictly necessary to do so—but in order to have the most convenient material to burn and crumble, the crust should be cut off. These 1,500 grains of bread he cut into thin slices, placed them on a platinum tray, and exposed them to a cherry-red heat until they became charred. When completely charred, which was known by the slices no longer burning with a flame or evolving unpleasant fumes, he took this charcoal, ground it in a mortar into a fine powder, and then returned it to the platinum tray, and exposed the powder to a cherry-red heat until it was reduced to a grey ash. He then withdrew the lamp, and moistened the grey ash with a solution of nitrate of ammonia, and applied again a red heat to the mass for the purpose of burning the last portions of charcoal remaining. Then he poured upon the ashes in the tray a few drops of hydrochloric acid sufficient to moisten them, and, in the course of a minute or two, he washed the whole in a porcelain capsule, and evaporated to absolute dryness, in order to render the silica perfectly insoluble. That was the slight modification which he considered necessary. The perfectly dry residue was then boiled in the porcelain or silver capsule with dilute caustic potash, and the whole was then thrown on a filter, and after slightly supersaturating the strongly alkaline filtrate with hydrochloric acid, carbonate of ammonia was added in excess to the filtrate thus slightly acidified, and if a white precipitate was produced, it was very probable, indeed, that it was alumina; and if, taking that white precipitate, washing it, and treating it before the blow-pipe with nitrate of cobalt, the result was an unfused mass of a beautiful blue colour, then he said that substance was alumina. Through the kindness of Dr. Gilbert he had obtained thirteen samples of ashes, produced, most likely, under the same conditions as those supplied to Dr. Odling, and produced, if he recollected rightly, from wheat grown in the seasons of 1849 down to 1856. He examined all of them, and on treating them in the way he had described, he did not discover the least trace of alum, nor

was there a vestige of white precipitate produced after standing for twenty-four hours. With reference to the prosecutions which had been instituted against bakers for using alum in their bread, he, as a chemist, had nothing whatever to do with the question whether alum was injurious or not to the human system. His business was to answer the question put to him, "Is there alum in this sample of bread, or not?" In most cases of such prosecutions, the parties denied the use of alum, but, after analysis had proved its presence, they all had admitted that they had used it; and, moreover, alum had been seized on most of their premises, either by itself or mixed with the salt they used in the manufacture of the bread. That was sufficient, he thought, to set at rest all surmises on the subject. They might say it was impossible that alum could be present, but there it was. His invariable practice, in cases of prosecution where he was called in, was, to advise the parties to impound the bread to be analysed by another chemist, but, except in one instance in which his analysis had after all been confirmed by that of another eminent chemist, they had never availed themselves of the offer, and, as he had just said, had afterwards acknowledged that they had used alum. It had been urged that there was no positive evidence that the habitual use of alum in bread was or was not injurious; he was not called upon to decide such a question; whether it was injurious or not was a purely medical question, which it was the province of medical men to answer; all he could say was, that if they were to wait for positive evidence of the mischief caused by the use of objectionable things, there was scarcely anything the removal of which would not be successfully resisted. He had never heard of a case of a person actually dying from drinking Thames water, or that any one had been positively killed by the effluvia from the house drains. Were we, then, to leave these and other abominations undisturbed? Surely, if it was known that, when a certain substance was taken internally, its effect was to disorder the organs of digestion, we might, without great violence to our reason, say that the many cases of dyspepsia and other diseases, the origin of which was obscure or unknown, might be referred to the constant introduction, day after day, and year after year, of that substance into our food. At the same time it was necessary to be careful, before charging persons, of otherwise undoubted probity, with using deleterious substances in their manufactures, when the character of such persons depended upon the truth of such a charge; but this was another question, and, as far as he was concerned, it was a satisfaction for him to know that all the persons who had been fined in consequence of his evidence, had admitted the accuracy of the charge by pleading guilty either at once, or at some more advanced part of the proceedings. These explanations, he thought, would suffice for the present. As to the sheer incredulity with which the assertion had been met, that alum had upon two occasions been found in bread, actually in the shape of crystals, and the alleged extravagance of the fact, he had only to say, that, however unlikely this might appear, it was a fact for all that; and however clever might be the reasons adduced in proof of its improbability, these reasons were hardly sufficient to charm away that which was actually found, seen, touched, examined, and identified as alum, not only by him (Dr. Normandy) but by other chemists, whose reputation for skill and truthfulness stood at least as high as that of those incredulous persons who, however, did not venture to deny that alum was, or, until quite lately, had been used by almost all bakers, for that, unfortunately, was also a fact too well established to be in any way disturbed. With respect to the process of M. Mège-Mouries alluded to in the paper, he did not think that M. Mège-Mouries attributed the dark colour of the bread to the action of cereal in upon the starch. It appeared that the cereal in which existed in the perisperm of the grain, in the bran, acted upon the gluten, which it softened,

cumulative and dark, whereby a colour was imparted to the bread, a colour, the English brown bread, which was made of bran, and for which the English could perhaps be more appropriately named. The grey bread of France was made of rye, mixed or not with wheat, and there was no question that it was the gluten, which, in a certain degree, imparted that peculiar colour to the bread.

Dr. Odling had been made in the paper by him in the *Lancet*, as to the alum found in bread supplied by a baker in the locality. He at the same time expressed his doubts as to the quantity of alum in the bread supplied by the bakers used more than those who were of May-fair, but such was not the case. He expressed his doubts as to the quantity of alum in the bread. There might be a case where he was pretty sure he (Dr. Snow) was right. He had a portion of the same bread before him, and he should re-sume his investigation, and if he found that he had been in the quantity of alum he had stated it to be, he would acknowledge his error. He had many times reached the conclusion that the practice of using alum in bread was a fruitful source of rickets, and that he had not published his opinions. It appeared to him that rickets were amongst children in London and the north was the case in the north or in the south. Children were just as overcrowded and supplied with milk as in London. The rickets did not arise from a deficiency of the bone-forming ingredients in the food. The bones of a child could only be hardened by the administration of it. In the majority of the working classes the chief food of the children was bread. Dr. Odling had stated that when alum was used in the phosphate of lime in the flour was an indigestible phosphate of alumina, and that went to show that in the great majority of the working classes the substance necessary for the bones of the children did not consider this as the sole cause of rickets, because it might occur from a morbid condition of the phosphate of lime which ought to be in the system. When children were supplied with milk, or eggs, or potatoes, that would strengthen the bones. He was sorry to hear that the use of lime-water as a substitute for milk, because it would have a similarly injurious effect, could not be denied that alum was of great use to the bakers in the making of bread, but it was equally valuable in its chemical operation, and its injurious properties of alum. He believed, however, that for grown people the admixture of a little alum was not very injurious, though for children it was

knew that if paste was made too thin, and alum was mixed with it afterwards, it made it thicker, and it was also known that borax possessed similar properties. Those facts put together, went to show a similar action to tanning. He (Mr. Pittard) was still by no means convinced that the alum did not tan the gluten of the flour. Dr. Odling had certainly gone far to say that it tanned the diastase, and had carefully abstained from saying much as to the effect, bad or good, produced by it on the human body. For his own part he and many other medical practitioners had a settled belief that alum in bread was injurious to mankind. Sickly children had been found to improve marvellously upon baked flour, whilst they pined away upon soaked bread. The chemists spoke slightly of the medicinal men because they did not pretend to know the chemistry of the question, and said that they were ignorant that the alum was decomposed in the making of bread. Even if that were so, it did not prove that the alum was rendered innocuous; if alum was resolved into alumina and sulphuric acid, he did not know whether alumina might not be injurious to the body. It was a fact worthy of note that, although alumina was one of the most plentiful substances on the earth, yet it did not enter into the composition of any organic bodies whatever, whether animal or vegetable. This alone was a reason against the introduction of alum into food. With salt it was very different. They might be told that the chemical effects of alum on the animal system were not extraordinary, but there were chemical effects to be considered. Finely pulverised glass would cause the death of an animal, and yet no one would assert that it was a powerful chemical substance, though the mechanical effect upon the intestines of a dog on which the experiment was tried, was sufficient to kill it. Dr. Odling had told them it was convenient to the bakers to use alum. No doubt of that. It might make nice looking bread, but if it did great injury to those who ate this bread, it ought not to be used, any more than pernicious colouring ingredients should be used in other articles of food.

Mr. VABLEY begged to add his testimony to that of Mr. Pittard with regard to the pernicious effects of alum upon the human system, as he had found from personal experience. With respect to the admixture of alum with paste to prevent mildew, he had found that longer boiling of the paste had the same effect, whilst the action of alum on delicate tints of colour was obviated.

Mr. JOHNSTONE mentioned that during a harvest some years ago the wheat had been got in in very bad condition. The question was discussed by Professor Faraday and others, and they came to the conclusion that carbonate of magnesia would have a most beneficial effect upon it in making bread, and this would no doubt have been adopted had it not been for the expense. For many years he had used in his family bread made with hydrochloric acid and bi-carbonate of soda, which was most excellent.

Mr. T. A. MALONE said it had been mentioned that bakers had placarded their bread as having "all the gin" in it,—on the same principle let them now announce, "bread with alum in it," and people could then exercise their choice whether they would have it or not. He thought that would be the most honest way of dealing, because if the addition of alum to inferior flour made bread more presentable to the eye than that made from the best flour without alum, it was a species of fraud that ought not to be countenanced. They were told that it was still an open question whether or not alum was injurious to the human system. The same doubt prevailed with regard to the emanations from sewers, but as all sensible people avoided open sewers as much as possible, so he for his own part would wish to avoid bread with alum in it. Dr. Normandy had told them that if he obtained from the white precipitate a blue colour before the blow-pipe by the addition of cobalt, he was entitled to consider that it contained alumina, but it was known

Mr. PITTARD said, having been indirectly alluded to as on the subject of adulteration of food, he would make two remarks. Dr. Odling's paper had put before them the novel and interesting discovery of the presence of a large quantity of sugar in flour of an inferior quality. It had long been known that a large quantity of sugar was found in wheat when in a state of decay, and now they had the additional fact that it was found in flour, and it was also interesting to know that it prevented its formation. For these reasons it was a valuable and instructive one. He had perhaps unfortunately—stated that the addition of alum in bread was analogous to tanning, and that it was a substance like wash-leather. They

that other matters became blue by the action of cobalt besides alum.

Dr. NORMANDY said it was the precipitate, obtained in the way he had described, which should be submitted to the nitrate of cobalt; and if a blue colour were obtained he felt certain that this test could be practically relied upon.

Mr. MALONE added that the potash employed might allow some of the phosphates to remain, and these would give a blue colour. He believed that, unless the final precipitate were completely re-analyzed, they were not entitled to speak with certainty as to its composition.

The CHAIRMAN said some of the phosphates of alkaline earths were soluble in potash.

Mr. MALONE said it had been stated that alum rendered bread light and friable; he was not sure that that was any recommendation in point of digestibility, and he was doubtful whether a more sodden mass would not be more soluble in the stomach. Milk became a coherent mass very soon after it was received into the stomach; he thought this was a point worthy of further consideration.

Dr. GILBERT said, that the subject of the propriety, or otherwise, of adding alum, and certain other matters, with the same object, to bread, was one of such great practical importance, that while there were others, as he saw there were, in the room, who had been much occupied with the question, and had not yet spoken, he felt it to be almost an improper digression to lead the attention of the audience in another direction. In obeying the call of the Chairman, he would, therefore, be very brief on the points with which he was himself best acquainted. With regard to the alum question, he suspected the truth lay somewhere between the two extremes which had been advocated by the respective speakers. He was not disposed to think that alum could be, with advantage to the consumer, added to really good flour, for the purpose of bread-making. On a large class of constitutions he thought there was medical testimony enough to show, that alum, or alumina, in bread acted injuriously. With such it induced constipation, and this was a fruitful source of more serious disease. On the other hand, it was to be remembered, that owing to the seasons, which we could not control, a considerable portion of the flour, which must be consumed by somebody, was not in a perfect condition to yield a bread of good texture and other requisite characters without the aid of some extraneous matter; and if the bread were not of suitable texture and condition, its digestion would be imperfect, and if digestion, then assimilation also. The question was then, so far as related to alum, whether or not the benefits which it undoubtedly produced, so far as the physical and some other characters of the bread were concerned, were greater or less than the evils he believed it in many cases induced. The subject required much careful consideration, and if a substance or a method, that would have the same effects in retarding the chemical changes to be avoided in flour and bread, and which at the same time was undoubtedly innocuous could be generally adopted, few would then uphold the use of alum. The suggestion of Dr. Odling to use lime-water, as recommended by Baron Liebig, was deserving the serious attention both of bakers and medical men. Dr. Odling had quoted the opinion of Mr. Lawes and himself (Dr. Gilbert), to the effect that the best flour in the estimate of the baker was that which contained a comparatively small proportion of gluten or other nitrogenous constituents, and a large amount of starch; and, further, that this estimate was a correct one, so far as the consumer of the bread was concerned. This was, in fact, the case, as matters stood; but some little amplification of the statement was needed, to avoid misunderstanding. He would not say, that a comparatively high per centage of gluten was not desirable, provided the flour had also all the other qualities requisite in a good bread flour. These depended much on physical character and chemical condition, as well as on ultimate chemical composition. Thus it happened that our home-

grown wheats, and many grown under somewhat similar climatic condition, seldom at once ripened well, and yielded a high percentage of nitrogenous compounds. There were exceptional seasons; but the average was as here stated. Our wheats which ripened best were generally low in percentage of nitrogen, and high in that of starch; and the high condition, with little tendency to fermentative changes, was of more importance than the richness in nitrogen, within the limits usually occurring. The highly glutinous wheats, on the other hand, from hotter summers than our own, generally were structurally objectionable for the purposes of bread making, except in small proportion, with less matured wheats. These highly nitrogenous grains were generally very hard, refractory in the mill, not yielding either an easily workable dough, or a bread of light and open texture. From opposite causes, therefore, the highly nitrogenous wheats, as they occurred in commerce, were more or less objectionable; and hence it was, that, in practice, the flour containing a small proportion of nitrogenous matter, and a large one of starch, was generally the best, so far as the consumer was concerned. It might be added, as the result of the observation of dietaries on the large scale, that in practice the labouring classes, under the idea of improving their diet, generally first added to their bread, fatty matters of some kind, which still further diminished the relative proportion of the nitrogenous to the respiratory constituents of their food. The addition of bacon would be an admitted improvement upon a purely bread diet for a working man, for when it was considered that a given weight of the fat of the bacon, had about twice and a half the respiratory capacity of the starch of the bread, it would be easily seen how much the proportion of the nitrogen in the food would soon be diminished by the employment of the bacon. In the evidence which the statistics of food afforded, we had therefore, additional reasons for the conclusion, that a comparatively high percentage of nitrogen in flour and bread was by no means a safe test of their food value. He would only add, in reference to the discrepancy which there appeared between the average amounts of water found in bread, by Dr. Odling on the one hand, and Mr. Lawes and himself on the other, that the different modes of operating sufficiently accounted for the different results obtained. Dr. Odling's determinations were made upon the crumb or inner portion only of the loaf, which contained a larger proportion of water than the whole loaf. Their own determinations, however, were made upon entire loaves, in the condition, therefore, in which the bread in the bulk was sold by the baker and eaten by the consumer.

Mr. DUGALD CAMPBELL regretted that the lateness of the hour would not allow him to go into a full discussion of the paper, but, as a chemist, who had bestowed considerable attention upon the adulteration of substances generally, and substances of an alimentary nature particularly, he must say that the statements commonly put forth as regarded the use of alum in bread-making were, as the author of the paper had stated, very much exaggerated, and alarming to a degree truly unnecessary. He for one did not think that a small quantity of alum put into bread before baking it, so as to make it more pleasing to the eye, or for any other object, was calculated to be deleterious. He was not prepared to say that a large quantity of alum put into dough might not cause it, when consumed as bread, to be injurious, but he was prepared to say that such a quantity as would do an injury would render the bread unsaleable. He (Mr. Campbell) congratulated the meeting that the "anti-alum-in-bread" gentlemen had argued their case that evening in a milder form than generally, for usually he had heard them assert that they had found crystals of alum of the size of peas in bread. Now, he would ask how could this be unless alum were put into the bread after it came out of the oven for the purpose of deception, for the action of the oven upon dough with alum was entirely to decompose it, and the

in the bread or extracted
the alum was decomposed,
combination with the phos-
phate of alumina, and it
phosphate of alumina,
alumina in it, that the
used in the manufacture

It was a much more
than persons generally
agreed with the author
as he had detailed as generally

by it alumina (that is what
ignorant persons) was sure to
though it was known to have had
heard from a gentleman who
about alum in bread, that he
a modification of it. He had

and he (Mr. Campbell) as-
that modification, he could
results, and that he could
as he declared, and, more-

what was supposed to be
had been used in making the
that in every instance where
imony that the bakers had put

(the bakers) had confessed to
mere accident, he (Mr. Camp-
the court at Uxbridge where a

is going on, and the chemical
this very gentleman; he regretted
agree with him as to the perfect har-
confession of their guilt. A most

established baker of the place denied
was alum put into his bread, and
prove that he did not use it; but

after this denial, although ad-
vity was in this instance extremely
alum had been added, upon which
fined, and left the court still pro-

He (Mr. Campbell) urged upon the
of receiving, with no moderate de-
ments, upon chemical subjects, too

by medical men whose chemical ex-
For instance, lately they had had
and letters in the *Times* and elsewhere,

live in rooms papered with green papers,
selves to a slow poison, for the green of
ained arsenic, and arsenical fumes were
given off from it. He (Mr. Campbell)

upon professionally three times within the
by private individuals, who had become
their medical men, to investigate this subject,

For instance, found that there was no occa-
alarm whatever; there were no arsenical
off even at a temperature of 140 degrees.

ED SARR would call the attention of Dr.
the fact which he had omitted to notice; that
ence of the process of cooking on the bread.

important question was, how the bread should be
was to be considered whether, by longer ex-
the heat of the oven the starch would not be

more soluble in the stomach. The outer crust
was more digestible than the interior, and he
this point had not received sufficient attention.

the care of a large institution, he had never been
satisfy himself as to alum in bread having pro-
any specific effect. He was not prepared to deny
might be so. The strong fact mentioned by Mr.

should not be lost sight of—that alumina did
into the composition of any organic bodies.

would lead to the supposition that any small
of that substance taken in'o the system were

and not absorbed. He believed no chemist had
been able to find alumina in any part of the
of digestion, and the Germans had especially di-
researches in this direction.

Dr. NORMANDY entered into explanations in support of
the accuracy of the analysis he had previously described.

Mr. T. K. CALLARD said, he, in common with many
others engaged in the bread trade of London, was very
anxious that the use of alum should be done away with
in its manufacture. He did not deny that alum was ex-
tensively used, although many bakers did not employ it.
They would be glad if scientific men would investigate
the matter, and discover some less objectionable substance.
Dr. Snow had mentioned a quantity of alum as having
been found in bread that he (Mr. Callard) could not
suppose to be possible. Such bread could not possibly be
eaten, and he thought there must be some mistake as to
the quantity. In the manufacture of bread, common salt
was always used. Dr. Hassall had analysed salt, and all
the ingredients for making bread, in order that he might
see whether the alum was contained in the materials
before they came into the bakers' hands, and the result
was that he found alumina in the salt, and if that was the
case, there would scarcely be a loaf of bread without the
presence of this substance. It was therefore certain that
before evidence could be given that a loaf was adulterated
with alum, the chemist ought to be in a condition to
state that he found more of this substance in it than could
be due to the materials employed.

Dr. OBLING said that the question of the use of alum
in bread involved two considerations, namely, whether
or not it was fraudulent, and whether or not it was
injurious. He considered that it was not fraudulent.
The public demand in everything was for a good article
at a low price, and manufacturers were justified in
competing to supply that demand. There was a competi-
tion for price and a competition for quality, and the two
balanced one another. Once upon a time a glue maker
first introduced sulphate of zinc into his glue and size,
whereby he was able to produce as good and durable glue
and size as his neighbour obtained from higher priced
materials. It was true he did not issue placards "size
with white vitriol in it," but by means of white vitriol
he effected a real improvement in the manufacture, and
the public were eventually benefited by obtaining as
good an article as previously at a lower cost. Now that
alum improved the quality of bread made from inferior
flour was indubitable, and admitting for the moment
that it was not injurious to health, he considered that
a baker was perfectly justified in using it, inasmuch as
it enabled him to meet a popular demand, by furnishing
an approved loaf at a low price. But he admitted, most
fully, that if it should be proved that alum in bread was
prejudicial to health, it must, at whatever cost, be dis-
pensd with. But he contended that the use of small quan-
tities of alum in bread had not been shown to be in-
jurious. All arguments founded on the effects of alum
per se were fallacious, inasmuch as it had been clearly
proved by the investigations, first of Mr. L. Thomson,
and then of several other chemists, that in bread alum
no longer existed as alum, but underwent a most complete
decomposition. Arguments founded on observation might
be reliable, if different observers agreed. But one said it
caused rickets; another, consumption; a third, consti-
pation; a fourth, gastro-enteritis; and a fifth could not
perceive any effect whatever. Now, in all cases of
chronic poisoning, even by the most minute doses,
whether of arsenic, lead, mercury, copper, or silver,
&c., the symptoms, though not of an obtrusive char-
acter, were so characteristic that all observers recog-
nised the same evils and ascribed them to the same
cause. He admitted that alum might occasionally be
present in such quantities as to do harm, but he con-
tended that the prevalent notions on the subject were
founded on prejudice and assumption, not upon dispa-
sionate proof. He would reply *seriatim* to some of the
remarks that had been offered. Dr. Normandy had de-
scribed a process for the detection of alum, or rather
alumina, and, although he could scarcely doubt in his
own mind that the results Dr. Normandy had c

that other in,"
besides alone

Dr. NORMAN, in the way he had used the nitrate of cobalt, he felt certain that

Mr. MALONE wishes to allow some of the members to give a blue coat to the precipitate which is entitled to speak.

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Mr. MAI
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Dr. C. C. or others with the practical business saw the need of a book to be a guide to the call of the brief on the quality of the trial which he was to advance for the constitution of the jury. It was a book, in hand, which the trial in a paper and extra textural if different then, fits with and so were cases considered have to be a time adopted suggest mention had to (Dr. C. C. the est compar genous further the co fact, t ficat ion derstar high y the good character character.

EAST LANCASHIRE UNION OF MECHANICS' AND OTHER INSTITUTIONS.

EXAMINATION AND PRIZE SCHEME OF MALE AND FEMALE CLASSES FOR 1858.

The East Lancashire Union of Mechanics' and other institutions was formed to encourage and reward men and women in self-education.

The Council of the Union require a certificate, in the following form, from every candidate for examination:—

"The undersigned certify of personal knowledge that is a of sober, honest, and industrious habits, attentive to the duties of station in life, and that has not been instructed at any higher than an elementary day school, Sunday school, evening class, Mechanics' or Institution."

Any candidate who may bring this certificate, signed by his employer, or minister, or by the directors or president of his Institution or Evening School, will be admitted, after one month's notice, to the annual examination as a candidate for the certificates and prizes of the East Lancashire Union.

Before receiving any Institution or Evening Class into union, so as to admit a member of its Committee to the Council of the Union, and to permit such Institution or Class to have the aid of the local and organising masters sent out to be appointed, the Council must be satisfied as to the character and efficiency of such Institution or Evening Class.

But the intention of the Council is to encourage and reward such persons, supported by manual labour, within the Union, as are making efforts for self-education, either in evening schools, mutual instruction societies, Mechanics' and other Institutions, or by their own solitary or partially-aided studies, irrespective of their connection with any Evening Class or Institution in union, and they will require no other qualification for admission than the above-described certificate and notice.

The scheme for the Examination and prizes for the year 1857-8 will define to what candidates certificates will be granted. Prizes are open to competition, by entries in the English language and one additional subject.

In each subject, in each class, candidates may take a mark of competency, merit, and of highest merit.

In each class there will be the following distinctions as subjects:—

1.—*Exercises in English Language.*—First, second, and third class "English language certificates" will be granted to all who obtain marks of competency. The degree of merit will be carefully defined in the certificate.

2.—Any candidate who may obtain marks of merit on one subject, in addition to marks of competency or merit on the English language, will receive a book prize in addition to the certificate.

These certificates will be distinguished as *upper English language certificates* of the first, second, and third class.

3.—The candidates who obtain the required marks to obtain the money prizes and prize certificates.

The money prizes may, however, be received in books supplied with the arms of the East Lancashire Union, or an appropriate inscription if preferred.

To render these arrangements clear, the Council set forth in detail the three divisions of their requirements.

English language certificates, upper English language certificates and book rewards, and for money prizes with prize certificates.

THIRD CLASS.

In the third class the Council require such elementary knowledge as is necessary in the common arts of life, and most important as a means of progress in self-education.

The second section of the third class will comprise:—1. English reading. 2. Writing from dictation with correct punctuation and spelling. A competent knowledge

will be denoted by twenty marks on each subject. Thirty marks will denote merit, and sixty the highest merit. Any candidate gaining these marks of competency or merit will obtain a certificate for English language in the second section of the third class.

The other subjects in the second section will be:—(1) Arithmetic, as far as simple proportion, and (2) the geography of England, for each of which thirty marks will denote competency; forty, merit; and ninety, the highest merit. Any candidate obtaining marks of competency or merit in the English language, and marks of merit on one other subject, will obtain a book, in addition to his English language certificate, and a more valuable volume for marks of merit on an additional subject.

The first section of the third class will comprise:—(1) Reading aloud with good articulation and expression. (2) Writing from dictation, with correct punctuation and spelling. (3) Writing from memory a simple narrative, read aloud twice by the candidates. (4) Writing a letter on some probable domestic occurrence, selected by the Examiner. It is not intended, in this class, to test the knowledge of spelling and grammar, otherwise than by these exercises.

Competence will be denoted by twenty marks; thirty will denote merit; and forty-five the highest merit.

A candidate gaining marks of competency in these exercises will obtain a *Certificate for English language* in the first section of the third class.

The other subjects in the first section of the third class will be (1) Arithmetic in the rules which commonly precede decimal fractions. (2) Geography of Great Britain, limited to the mountain chains, water-sheds and river drainage, and the situation of the coal-fields; all of which will be considered as affecting the sites of the chief ports, towns, and manufactures.

Thirty marks will denote competency; forty merit; and eighty-five the highest merit in geography and arithmetic.

A candidate obtaining marks of competency or merit in the English language, and marks of merit in one other subject, will obtain a book in addition to his English language certificate.

A more valuable volume will be given if marks of merit be obtained in a second additional subject.

THE MONEY PRIZES AND THE PRIZE CERTIFICATES IN THE THIRD CLASS.—SECOND SECTION.

The Council will award prizes of one pound to the six best candidates in the second section.

FIRST SECTION.

The Council will award prizes of two pounds to the five best candidates in the first section.

SECOND CLASS.—ENGLISH LANGUAGE EXERCISES.

Each candidate will be required:—(1) To analyse and parse, in writing, a passage of English. (2) To paraphrase a passage from verse into prose. (3) To repeat with proper expression, fifty lines from Cowper's "*Charity*," selected by the Examiner. (The whole poem or the first four hundred lines must in that case be committed to memory.)

Competency will be denoted by twenty-five marks; merit by thirty-five, and the highest merit by forty-five.

The remaining subjects in the second class will be:—(4). To work decimal fractions, and the usual rules in the mensuration of plane surfaces and solids. (5). To answer, in writing, questions on the geography of the British Islands and Empire. (6). To answer questions on the simple mechanical powers (lever, wheel and axis, pulley, wedge, screw).

Competency will be denoted by thirty marks; merit by forty marks; and the highest merit by sixty-five.

A candidate obtaining marks of merit on one subject besides the English Exercises will obtain a volume in addition to his English language Certificate. The highest merit will be denoted by four hundred marks.

The Council suggest that the class-rooms of the several Institutions should be neatly fitted up with groups of parallel desks and benches suitable for the instruction of classes of 18 or 21 in three rows of six or seven pupils each. Such groups of desks and benches facilitate that effective teaching which it will be the duty of the organizing masters to introduce, where it does not at present exist. The classes should also be provided with black-boards, easels, maps, class-lesson books, and slates. The Council recommend the directors of the several Institutions to take steps to have the instruction in their existing classes regulated, so as to prepare their pupils for examination, especially by accustoming them to written exercises. They also suggest that, in the month of March and April preliminary examinations should be held in each Institution of all pupils desirous to become candidates; and each pupil should, after such examination, be advised as to the class in which he should enter himself.

The examinations will be conducted by one or more impartial persons selected by the Council.

The examination will be partly oral, but chiefly by means of written answers to printed questions, which will be put before the candidate.

The candidates will answer these questions without assistance from books or from each other, and write in the presence of the examiners. When the answers are finished, they will be sealed up, and sent to the gentleman unknown to the parties, who will make marks to each paper. As soon as this is done, the successful candidates will be declared.

Prizes will be distributed publicly.

The chief employers of labour in the district have declared that they will attach much value to the certificate granted by the Council as proofs of meritorious education, correct life, and mental capacity, in giving employment or promotion. It is hoped that they will attach a distinct mercantile value, and promote the commercial advancement of successful candidates.

The Council have purposely not specified skill in any particular list of subjects of examination, because they propose to award separate prizes for such skill.

The prizes will be divided as follows:—

Drawing of form from Models and Diagrams, on the plan published by Mr. Butler Williams.

Map and Plan Drawing, for Surveyors of Land, &c.

Mechanical Drawings, including Machinery, Tools, and Working Drawings, of Buildings, Carpenters' Work, and Ship Work, Excavations, &c.

Architectural Drawings.

Industrial designs for all the trades of the District.

Drawing of the Human Figure.

Special arrangements will be made for the examination of the progress of pupils in the several Schools of Art, and for testing their ability; and a prize will be awarded under each of the above heads.

SOUTH KENSINGTON MUSEUM.

During the week ending 3rd April, 1868, the visitors have been as follows:—On Monday, Tuesday, and Saturday, free days, 8,713; on Monday and Tuesday, free days, 8,449. On the two Students' days (admission 6d.), 409; one Students' evening, Wednesday, 276. Total 7,897.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Delivered on 26th and 22nd March, 1868.
SECOND SESSION, 1867.

(C). Poor Rates and Pauperism—Return (C).

Delivered on 23rd March, 1868.
1. Public Offices (Downing-street)—Copy of Correspondence.

122. Duchy of Lancaster—Account.

130. Income Tax Collectors (Tynemouth)—Return.

141. Railway and Canal Bills—1st Report from the General Committee.

Delivered on 24th March, 1868.

120. Poor Law Medical Relief (Scotland)—Returns.

127. Sandhurst College—Return.

128. Bands, &c.—Return.

133. Hope—Return.

139. Shipping—Return.

Delivered on 25th March, 1868.

123. Printed Papers—Return.

143. Civil Services—Estimate to Votes "on Account."

146. Committee of Selection—Fifth Report.

147. Army (Educational and Scientific Branches)—Supplementary Estimate.

121. Oxford University—Copies of two Ordinances.

117. Railway and Canal Bills (70. Athyney and Tuam Railway; 71. Ballymena, Ballymore, Coleraine, and Portrush Junction Railway; 72. Hanbridge, Lisburn, and Belfast Railway; 73. Belfast and County Down Railway; 74. Dublin and Meath Railway; 75. Great Northern and Western of Ireland Railway; 76. Limerick and Castle Connell Railway; Leitrim Railway and Lough Allen Pier; 77. Waterford and Kilkenny Railway (Capital); 78. Waterford and Kilkenny Railway (Power of Purchase, &c.)—Board of Trade Reports.

38. Bills—Customs Duties.

MEETINGS FOR THE ENSUING WEEK.

MON. Architects, 8. Mr. C. R. Cockerell, "Some Remarks on the old Vatican Basilica, and its conformity to the Christian rules of Building known to us, of subsequent date."

Geographical, 8½. I. Dr. H. Rink, "On the Supposed Discovery of the North Coast of Greenland and an open Polar Sea, &c., by Dr. Ellsha Kent Kane, U.S. Navy."

II. Mr. Wm. Lockhart, "On the Importance of Opening the Navigation of the Yang-tse-kiang, and the changes that have lately taken place in the bed of the Yellow River, &c."

TUES. Royal Inst., 3. Mr. J. P. Locatle, "On the History of Italy during the Middle Ages."

Syro Egyptian, 7½. Mr. Thos. Sopwith, "On the Progress of Modern Improvements in Egypt."

Civil Engineers, 8. Mr. G. Robertson, "On the Theory and Practice of Hydraulic Mortar."

Med. and Chirurg., 8½.

Zoological, 9.

WED. United Service Inst., 3. Mr. John Craufurd, "On India, as connected with a Native Army."

Literary Fund, 3.

Archæological Assoc., 4. Anniversary.

Society of Arts, 8. Mr. J. MacGregor, "On the Paddle Wheel and Screw Propeller, from the Earliest Times."

Chemical, 8. Dr. Odling, "On Atoms, Molecules, and Equivalents."

Geological, 8.

Graphic, 8.

THURS. Royal Inst., 3. Prof. Tyndall, "On Heat."

Antiquaries, 8.

Linnæan, 8.

Royal, 8½.

FRI. United Service Inst., 3. Capt. Tyler, "On the Effect of the Modern Rifle upon Siege Operations, and the means required for counteracting it."

Royal Inst., 7½. Mr. Robert Godwin Austen, "On the Conditions which determine the probability of Coal beneath the South-Eastern parts of England."

SAT. Royal Inst., 3. Mr. Edwin Lankester, "On the Vegetable Kingdom in its relations to the life of Man."

Medical, 8.

Asiatic, 8½. Mr. Cyril C. Graham, "On the Ethnology of Syria and Palestine, from the earliest times down to the present."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, April 2, 1868.]

Dated 1st Dec., 1867.

2982. J. Young, Glasgow—Imp. in measuring liquids.

Dated 16th Feb., 1868.

292. R. Anderson and J. J. Prescott, Duke street, Liverpool—Imp. in lubricators.

Dated 18th Feb., 1868.

306. J. Fiddington, 77, Montagne de la Cour, Brussels—Imp. in the manufacture of fuel, commonly called artificial or patent fuel.

Dated 20th Feb., 1868.

323. T. Metcalf, Newton Heath, Manchester—Imp. in the purification of crude tar oil, rendering the same suitable for lubricating machinery and other similar purposes.

- Dated 3rd March, 1858.*
420. J. Gowing, Poplar, and H. Ball, Greenwich—Imp. in apparatus for preventing smoke, applicable to tubular boilers.
- Dated 3th March, 1858.*
478. F. C. Warlich, Hope-cottage, Gloucester-place, Kentish-town—Imp. in apparatus for generating steam.
- Dated 11th March, 1858.*
490. A. J. Holdsworth, Leeds—A safety railway oral communication.
492. G. T. Bousfield, Loughborough-park, Brixton—Imp. in knitting machines. (A com.)
494. J. D. Leathart, Newcastle-on-Tyne—Imp. in furnaces.
- Dated 12th March, 1858.*
496. A. Porecky, 7, York-street North, Hackney-road—Imp. in the manufacture of the frames of umbrellas and parasols.
500. T. Thompson, Radbourne, Derby—Imp. in vats for cheese making.
502. W. Pearson, Brierley-hill, Staffordshire—A new or improved washing machine.
504. J. Wright, 10, Alfred-place, Newington-causway, Southwark—Imp. in the treatment of machine-made malleable iron nails. (A com.)
506. A. V. Newton, 68, Chancery-lane—A new combination of instruments for extracting teeth. (A com.)
- Dated 13th March, 1858.*
510. C. Tilliers, Brussels—Certain imp. in machinery for forging, planing, and stamping cold or heated metals.
512. G. Pigott, Nottingham—Imp. in Jacquard machinery for figuring lace and other fabrics.
516. A. V. Newton, 66, Chancery-lane—Improved machinery for making horse shoes. (A com.)
- Dated 15th March, 1858.*
518. J. C. Martin, Fern cottage, Charlewood-road, Putney—An improved plastic compound for the manufacture of moulded articles, to be used as a substitute for wood carvings, and for many of the purposes to which papier maché is applicable.
522. B. A. Brooman, 164, Fleet-street—Imp. in sewing machines. (A com.)
528. J. Hamilton, junr., Liverpool—Imp. in apparatus for propelling vessels.
530. J. F. Empey, junr., Birmingham—An imp. or imps. in ornamenting certain kinds of buttons.
- Dated 16th March, 1858.*
532. D. Gallafant, Steepley Causeway—Certain imps. in machinery or apparatus for cooling liquids and condensing vapours.
534. M. Henry, 77, Fleet-street—Imp. in the manufacture or production of artificial marble, frescoes, and decorative, ornamental, and artistic surfaces, objects, and works. (A com.)
536. J. Lawson, Hope Foundry, Leeds—Imp. in machinery used in spinning flax and other fibrous substances.
- Dated 17th March, 1858.*
538. W. S. Clark, Atlas Works, Upper Park-place, Dorset-square—Imp. in machines for cutting and harvesting grain and grass crops. (A com.)
539. C. F. Vassero, 45, Essex-street, Strand—Imp. in the treatment of hair, and in the application of it when so treated as a substitute for whalebone in the manufacture of umbrellas, parasols, and similar objects. (A com.)
540. D. Nicoll, 114, Regent-street—Imp. in machinery for cutting out military, naval, and police uniforms, and other clothing.
541. W. Todd and J. Todd, Heywood, Lancashire—Certain imp. in power looms for weaving, and in shuttles to be employed therein.
543. J. Gooderham, John's-cottage, Mathias-street, Kingsland—Imp. in shoemakers' wax.
544. W. C. Benson, Marboe, Yorkshire—Imp. in apparatus to be used in the manufacture of glass bottles.
545. T. C. Hine, Nottingham—Imp. in lighting and ventilating by gas.
546. T. Evans, Hanover-street, River-terrace, Islington—Imp. applicable to the manufacture of parasols.
547. R. A. Brooman, 164, Fleet-street—Imp. in the construction of boxes or cases for trees, flowers, and other horticultural and floricultural purposes. (A com.)
548. W. Ward, Smithwick—New or improved machinery for the manufacture of nails, spikes, bolts, rivets, screw blanks, and nuts.
549. J. Orley, Beverley, Yorkshire—An elastic cushion or sitting piece for windows, blinds, shutters, and doors, which is also applicable for other purposes.
- Dated 18th March, 1858.*
551. R. Glanville, Bermondsey—Imp. in condensing steam engines.
553. J. Webster, Birmingham—Certain new or improved metallic alloys.
554. A. Dunslop and A. Stark, Moor Park Mill, Reafrow, N.B.—Imp. in dressing or rifling flour and meal or reduced grain.
557. B. A. Brooman, 164, Fleet-street—An improved knee cap. (A com.)
559. R. Townsend and W. Townsend, Bradford—Imp. in piston-rod mechanical instruments.
561. A. A. Croll, Coleman-street—Imp. in the manufacture of parts of dry gas meters.
- Dated 19th March, 1858.*
563. P. F. Aerts, Brussels—Imp. in the construction of railway rolling stock, and in the lubrication thereof, and other moving parts of machinery.
565. G. Scott, Manchester—Imp. in generating elastic fluids, and in apparatus for that purpose.
567. W. H. Rhodes, Oldham—Imp. in speed indicators and calculators.
569. T. C. Medwin, 10, Clayton-place, Kennington-road—Certain imp. in the construction of water gauges for steam boilers.
571. D. Evans, 15, Railway-terrace, New town, Stratford—An imp. in apparatus for supplying air in streams to furnaces.
573. J. Young, Knaresboro—Imp. in chronometers, clocks, and watches.
- Dated 20th March, 1858.*
575. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—Certain imp. in the piercing of tunnels. (A com.)
579. L. Cowell, Adelphi—Imp. in machinery or apparatus for teaching the art of swimming.
581. R. Mills, Bury—Imp. in washing machines.
583. J. Biggs and W. Biggs, Leicester—An imp. in the manufacture of polkas when looped or elastic fabrics are used.
585. J. Le Franc, 58, Aldersgate-street—Imp. in pressure gauges. (A com.)
587. W. E. Newton, 66, Chancery-lane—An improved mode of treating and combining various combustible matters or substances for the production of artificial fuel. (A com.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

577. D. Harris, Massachusetts, U.S.—A new and useful or improved sewing machine. (20th March, 1858.)
548. R. Williams, 8, Bishop's-road, Victoria-park—An imp. in manufacturing a soap for cleansing, bleaching, and purifying purposes.—27th March, 1858.

WEEKLY LIST OF PATENTS SEALED.

- April 1st.*
2523. J. M. Napier.
2527. A. Illingworth and H. Illingworth.
2529. J. S. Willway.
2537. W. Riley and T. Riley.
2545. J. Rubery.
2548. R. Atkinson.
2555. E. Cavendy.
2557. R. H. Hughes.
2560. R. A. Brooman.
2564. W. Knapton.
2566. J. Warburton.
2569. W. Goessge.
2577. W. G. Craig.
2585. G. Scott.
2597. C. N. Leroy.
2650. W. Holroyd and S. Smith.
2685. J. J. Sieber.
2693. A. H. C. Chisland.
2749. D. Allison and J. Livingston.
2803. C. Clay.
3113. J. M. Napier.
110. P. Wilson, S. Northall, and T. James.
213. A. Crichton and M. Whitehill.
- April 8th.*
2843. G. T. Robinson.
2574. T. Grubb.
2600. W. H. Myers.
2628. F. H. Holmes.
2636. W. A. Roake.
2649. J. Wright.
3139. A. C. Kennard.
166. J. Wetherpoon.
192. J. Gray.
262. J. Chatterton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

- March 27th.*
418. A. E. L. Bellford.
- March 29th.*
708. W. Swain.
710. G. H. Babcock and A. M. Babcock.
752. C. Nickels and J. Hobson.
- March 30th.*
231. R. A. Brooman.
- March 31st.*
1865. J. H. Tuck.
- April 1st.*
729. F. Phillips.
736. W. Lund and W. E. Hipkins.
737. F. T. Botta.
745. H. R. Fanshawe and J. A. Fanshawe.
765. L. A. M. Mouchal.
- April 3rd.*
742. H. Powers.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4069	March 25.	Improved Solid Rule Joint	Griffiths and Hughes	Birmingham.
4070	" 23.	The Smokers' Sweetheart	A. Smart and J. Howland	Fenchurch street, City.
4071	" 26.	Reading Stand	Rev. A. W. Noel	Cropredy, Oxon.
4072	" 27.	Prismatic Reducer for Ceiling Gas Lights	W. Wilson	King-street, Manchester.
4073	April 6.	Tag or Fastener	M. Lyons	Quillick, Birmingham.

Journal of the Society of Arts.

FRIDAY, APRIL 16, 1858.

EXHIBITION IN 1861.

At a Special Meeting of the Council, held on Wednesday last, the 14th inst., the following resolutions were passed:—

The Council of the Society of Arts, bearing in mind the part which the Society took in originating the Great Exhibition of 1851, have considered it to be their duty carefully to examine various suggestions for holding an Exhibition in 1861, which have been submitted to them, and have resolved:—

1. That the institution of Decennial Exhibitions in London, for the purpose of showing the progress made in Industry and Art during each period of ten years, would tend greatly to the "Encouragement of Arts, Manufactures, and Commerce."

2. That the first of these exhibitions ought not to be a repetition of the Exhibition of 1851, which must be considered an exceptional event, but should be an Exhibition of works selected for excellence, illustrating especially the progress of Industry and Art, and arranged according to classes, and not countries; and that it should comprehend Music and also Painting, which was excluded in 1851.

3. That Foreigners should be invited to exhibit on the same conditions as British Exhibitors.

4. That the Council will proceed to consider how the foregoing resolutions can be best carried into effect.

CONVERSAZIONI.

The Council have arranged for two Conversazioni during the present session; the first on Saturday, the 24th April, at the Society's House, the card for which will admit the member only; the second on Saturday, the 8th May, at the South Kensington Museum, the card for which will admit the member and two friends, ladies or gentlemen. The cards for each of these evenings have been issued. Members who have not received them are requested to communicate with the Secretary of the Society of Arts.

Members of Institutions in Union who are anxious to attend either of these Conversazioni, are requested to apply to the Secretary of the Society of Arts, through the Secretary of the Institution to which they belong.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition was opened on Monday, the 5th instant.

The Exhibition will remain open every day until further notice, from 10 a.m. to 4 p.m., and is free to members and their friends. Members, by ticket, or written order bearing their signa-

ture, may admit any number of persons. The number of visitors up to yesterday, the 15th inst., was 1,785.

LOCAL BOARDS—PREVIOUS EXAMINATION.

Fifty Local Boards have been formed. Returns of the Candidates who have passed the Previous Examination have been received up to the 15th inst., as follows:—

Louth	4
Wigan	6
West Hartlepool	3
Leeds (Christian Institute). No. 1.	14
Northowram	1
Portsmouth	2
Warminster	1
Banbury	2
Macclesfield	83
Newcastle-on-Tyne	3
Lymington	1
West Brompton	4
Leeds, No. 2.	10
Wakefield	4
Pembroke Dock	4
Ipswich	6
London Mechanics' Institution	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	17
Halifax	15

Institutions and Local Boards are requested to take notice, that the Returns of the Previous Examinations should be forwarded *immediately* to the Secretary of the Society of Arts.

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date:—

T. D. Acland, Member of Council	£ 5 5
The Rt. Hon. C. B. Adderley, M.P.	5 0
John Ames	5 5
J. G. Appold, F.R.S., Auditor	10 10
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
H. D. Cunningham, R.N.	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation)	10 10
F. Seymour Haden (annual)	2 2
William Hawke	1 1
Edward Highton (annual)	£ 2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Coun- cil (second donation)	10 10

George Moffatt, M.P.	£10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford.....	1 1
Charles Ratcliff, Hon. Local Sec. (annual)... 10 10	
Joseph Skey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.....	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council } (third donation).....	10 10

GUTTA PERCHA.

The Council have appointed a Committee to direct the institution of a series of experiments on Gutta Percha, and to report from time to time such observations as may appear to elucidate the nature and cause of its decay, the different qualities of the substance, modes of detecting adulteration, or any other points valuable to the manufacturer or to those who use it.

The Council invite the co-operation of the Agricultural Societies in the superintendence of a series of experiments, especially as regards the employment of Gutta Percha in different soils, and for the distribution of liquid manures.

The Committee consists of the following, with power to add to their number :—

*H. Ford Barclay.

The Rev. M. J. Berkeley, M.A., F.L.S.

Dr. Albert J. Bernays, F.C.S., Lecturer on Chemistry, St. Mary's Hospital, London.

*Dugald Campbell, F.C.S.

Latimer Clark, A. Inst. C.E., Engineer to the Electric Telegraph Company.

Arthur Henfrey, F.R.S., Professor of Botany, King's College, London.

*Edward Highton, A. Inst. C.E., F.H.S., Consulting Engineer to the British and Irish Magnetic Telegraph Company.

John Lindley, F.R.S., Professor of Botany, University College, London.

*C. W. Siemens, C.E.

*Professor E. Solly, F.R.S. (Mem. of Council.)

*Sir Walter C. Trevelyan, Bart.

* Members of the Society of Arts.

The Committee have met three times, and with the view of obtaining as much information as possible in reference to the subjects above referred to, they propose to issue the following questions, which will be circulated amongst those most likely to afford the desired information :—

1. Over how long a period does your experience of the use of Gutta Percha extend, and for what purpose was the Gutta Percha employed?

2. Have you found the Gutta Percha so used to change its character, or decay, after a certain period? If so, state the length of this period, and the nature of the change.

3. Have you had the Gutta Percha analysed before and after this change? If so, give the analyses.

4. Can you state what change takes place in Gutta

Percha during its apparent drying and contraction, when exposed to the weather?

5. What, in your opinion, is the most effectual method of arresting this change?

6. Have you met with Gutta Percha mixed with any other substance, and, if so, with what substance or substances, and what have been the effects?

7. Have you had any experience of sulphured Gutta Percha, and, if so, state the results?

8. Have you made any experiments as to the tenacity of Gutta Percha? If so, what were the results; and were your experiments made with fresh or old Gutta Percha?

9. Have you found that exposure to light, heat, damp, cold, or any other special influences, alters the character of Gutta Percha?

10. Have you found any substance, such as tar, sea water, common water, &c., to be preservative of Gutta Percha?

11. Have you found that any particular substance have an injurious effect on Gutta Percha, or have you noticed that any insects or animals attack it?

12. Can you suggest any method of joining Gutta Percha superior to that now employed?

13. Do you know any means of rendering Gutta Percha a more perfect non-conductor of electricity?

The Committee are also desirous of obtaining information on the following points, having reference to the sources of supply of Gutta Percha:—

14. Is the Gutta Percha taken from the trees at particular seasons exclusively?

15. If taken at one particular season, does that correspond to the time of the renewal of foliage, of blossoming, or of ripening seed?

16. If taken at different seasons, at which of these seasons is the best quality obtained?

17. Has the age of the tree any influence on the quality of the Gutta Percha?

18. Is there any method practised of procuring Gutta Percha from a tree without cutting it down, and if so, with what results?

19. Are the products of different species of plants known indiscriminately under the name of Gutta Percha?

20. How far do the different qualities of commercial Gutta Percha depend upon any of the last six questions?

21. If Gutta Percha is produced by several trees, what are the scientific or native names of those trees, and which of them is at once productive of the best quality and most calculated for cultivation?

22. What parts of the world, and what kinds of soil and climate, appear to be best adapted for the cultivation of trees producing Gutta Percha?

23. What is the best mode of cultivation, whether by seed, cuttings, &c.?

24. What measures might be adopted with advantage to secure a continual and increasing supply of Gutta Percha?

25. If you have no experience yourself in this subject, do you know of any person who has, and who, by answering the above questions, or some of them, might tend to advance the present inquiry?

The Committee would feel obliged by replies to any of the above questions, as well as suggestions of experiments likely to elucidate the subject, being addressed to the Secretary of the Society of Arts, Adelphi, London, W.C.†

† Any person having portions of decayed or altered Gutta Percha, the causes of the change in which he is able to state, is invited to forward them to the Secretary of the Society of Arts, with their history.

As the labours of the Committee will be considerably increased by arranging and tabulating the results of this enquiry, it is particularly requested that answers to any of these questions be written only on one side of the paper, and that the number of the question answered be given at the head of each reply.

EIGHTEENTH ORDINARY MEETING.

WEDNESDAY, APRIL 14, 1858.

The Eighteenth Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 14th inst., J. Scott Russell, Esq., F.R.S., Vice-President, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Adderley, the Right Hon.	Bowles, Richard Francis
Charles Bowyer, M.P.	Oxley, John
Shuttleworth, Sir James Kay, Bart.	

The following Institution has been taken into Union since the last announcement:—

Wycombe Literary Institute.

The Paper read was—

ON THE PADDLE-WHEEL AND SCREW-PROPELLER, FROM THE EARLIEST TIMES.

BY JOHN MACGREGOR.

The approaching trial, for the first time, and on the grandest scale, of the paddle-wheel and screw-propeller in the same vessel, may well suggest the consideration of these two instruments in the same paper, while they are so different in origin and operation, that it will be best to treat of each of them separately.*

We shall begin with the paddle-wheel as the older method, though the other was first matured, and is now the more popular.

Several modern writers state that the paddle-wheel was used by the ancient Egyptians, but I can find no proper evidence to warrant this assertion.

The wheel of a chariot in an old Egyptian painting of a boat, has often been mistaken for a paddle-wheel, and a precisely similar mistake has been made in describing one of the sculptured slabs from Nineveh, but Sir H. Rawlinson and Dr. Layard assure me, that in their Babylonian researches they have not discovered any indication of the use of machinery for propelling vessels.†

Pancirolius, who wrote in 1587, says he saw an old bas-relief representing an Illyrian galley propelled by three wheels on each side turned by oxen. The same author, and several others, refer to Vitruvius for a notice of the paddle-wheel, but I find, in five editions of Vitruvius, the drawings represent merely a wheel turned by the water, and used as a log to measure the speed.

Again, Claudius Codex is said to have employed paddle-wheels in the invasion of Sicily in the third century before Christ, and some MSS. in the King of France's library (which I have not been able as yet to inspect), are referred to for this statement, but after diligent inquiry, I can find no confirmation of it in any accredited authority. An old work on China contains a sketch of a vessel moved by four paddle-wheels, and used perhaps in the seventh century, but the earliest distinct notice of this means of propulsion appears to be by Robertus Valturius, in A.D. 1472, who gives several woodcuts representing paddle-wheels.

Some months ago, I inspected two letters, written in A.D. 1543, by Blaseo de Garay, and now preserved in the national archives at Simancas, in Spain. These give the particulars of experiments at Malaga and Barcelona, with large vessels propelled by paddle-wheels, turned by 40 men. By many authors, and for a long time, it has

been positively affirmed that Blaseo de Garay used a steam-engine for marine propulsion, but, after careful and minute investigations at Simancas, Madrid, and Barcelona, I cannot find one particle of reliable evidence for this assertion.

After the various notices referred to, we find boats propelled by paddle-wheels mentioned by many early writers, such as Julius Scaliger, in 1558, Bourne in 1578, Ramelli in 1588, and Roger Bacon, 1597.

Before we consider the application of the steam-engine to turn paddle-wheels, it is well to notice briefly some of the other agencies employed.

The muscular power of men, of horses, and of other animals, was often used and frequently patented, even to the year 1848, by Miller; and 1856, by Moses. The Marquis of Worcester, in 1661, patented the application of a current, to turn paddlewheels on a vessel which they propelled by winding up a rope.* Papin, in 1690, proposed to work the wheels by gunpowder, exploded under pistons; Conrad (1709) used the force of the wind, Maillard (1733) and Goutarot (1853) applied clockwork, Harriott (1797) used falling water; weights were employed by Tremere (1801); Congreve (1827) used the capillary attraction of a wheel of sponge or glass plates; Dundonald (1833) applied the oscillations of mercury, and Jacobi (1838) employed an electro-magnet to work the paddle-wheels of a vessel on the Neva. The whole number of English patents relating to marine propulsion is 802, from the earliest, granted to Ramsey in 1618, to those of June, 1867.†

It appears that Denis Papin, in 1690, first proposed to use steam to work paddle-wheels. A rackwork was moved by pistons descending in steam cylinders by atmospheric pressure. Savery, in 1702, scarcely ventured with timidity to suggest the use of his steam-engine for the purpose, but it is asserted in a French work that Papin, in 1707, actually propelled a vessel on the Fulda by Savery's engine.

The first patent relating to a steam-boat is that of Jonathan Hulls, in 1736. He placed a paddle-wheel on beams projecting over the stern, and it was turned by an atmospheric steam-engine, acting in conjunction with a counterpoise weight, upon a system of ropes and grooved wheels.

The Comte d'Auxiron and M. Perrier are stated to have used a paddle-wheel steamboat in 1774, but the notices of these and of other early experiments are very vague, not contemporaneous, or on doubtful au-

* Chabert (1710), Drouet (1722), Pitot (1729), and Boulogne (1729), used a similar plan.

† The information contained in this paper was collected by the writer in compiling, for the Great Seal Patent Office, the "Abridgements of the Specifications" of these patents. Parts I. and II. of this work have been published by the Commissioners of Patents, and the remaining Part will shortly appear. As the authority for every statement is distinctly given in these publications, it will not be necessary to give references here. The following statistics relate to the patents above-mentioned. Patentees resident in the city of London, 83, in the county of Middlesex and city of Westminster, 252; Surrey, 59; Lancashire 46; Kent, 29; Hants 19; Yorkshire, 18; Gloucester, 18; Essex, 11; Sussex, 10; Northumberland, 9; Chester, 9; Worcester 6; Stafford 6; Derby, 5; Nottingham, 5; Durham 5. All the other counties have a less number and ten of them have only one each. Patentees resident in Scotland, 45; Ireland, 20; America, 18; other foreign states 46. Patents "communicated from abroad" 64; with two or more patentees 66. The patentees are described by the following avocations—engineers, 273; gentlemen, 251; tradesmen, 74; naval commanders, 14; medical, 11; ship-builders, 11; peer, 8; shipowners, 8; mariners, 5; machinists, 5; farmers, 4; architects, 4. A less number to each of 21 other professions. There are two female patentees, and the callings of 160 are not mentioned. 80 of the patents are dated in January, 46 in August, and the other months have intermediate numbers. 305 of these patents are under the new law since 1862, and of these 110 were allowed to become void after 6 months.

* The paddle-wheel propels a vessel in a direction perpendicular to the shaft, while the screw-propeller urges it in a direction parallel to the shaft.

† An old Chinese woodcut, in the late Dr. Morrison's library (at University College Library), has some resemblance to a paddle-wheel, but this also is probably misinterpreted.

thority. Desblancs, in 1782, sent a model to the Conservatoire (still there) of a vessel in which an endless chain of floats is turned by a horizontal steam-engine.

The first notice I can find of a successful trial of the steam-boat recorded by witnesses, is in a notarial certificate, which I lately inspected in Paris. This asserts that in July, 1783, the Comte de Jouffroy caused a vessel of 130 feet in length to be propelled for a quarter of an hour by a steam-engine upon the Saône, near Lyons.*

Experiments conducted about the same time, at Dalswinton, in Scotland, by Patrick Miller, resulted, in 1787, in the successful use of a steam-engine, by Miller, Taylor, and Symington, to propel a vessel by paddle-wheels, which worked one before the other in the centre of the boat.

The engine of this, the first practical steam-vessel, is still preserved by Mr. Bennet Woodcroft, Superintendent of Specifications at the Great Seal Patent Office, and it may now be seen at the Patent Museum in Kensington.

The *Charlotte Dundas* was built on the Clyde canal in 1801. Although Fulton used a steamer on the Seine in 1803, and another in America, *The Clermont*, in 1807, was the first that plied so as to be remunerative in that country. In 1809, the *Fulton the First*, steam-frigate, was launched at New York. Bell built the *Comet* in 1811, at Glasgow, and used it regularly for traffic next year. In 1815, Dr. Dodd steamed from Glasgow by Dublin to London in the *Thames*, which made a stormy passage of 768 nautical miles in 121 hours.

Steam navigation was introduced into France in 1815. In 1818, Napier's steam-packets ran regularly between Greenock and Belfast. It is said that, in 1819, the *Savannah* steamed from New York to Liverpool, but the assertion is very questionable. The *Comet* first carried the Admiralty pennant in 1822. In 1825, the *Enterprise* steamed from England to Calcutta in 113 days. Guns were first carried by the steamer *Salamander* in 1832.†

With respect to the various positions of paddle-wheels, it will be observed that most of those in earliest use were placed at each end of a shaft across the vessel. In Hull's plan (1796) the wheel was behind the stern; Bramah (1785), Miller (1787), and Symington (1801), placed the wheels in a passage inside the vessel open to the water. In Phillip's plan (1821) a wheel on deck turned on a vertical axis, and each float folded up to pass over the vessel. Submerged wheels on vertical axes were frequently patented. Sharples (1821) worked his wheel against the air; Harsleben (1826) placed the paddle-shaft at an angle to the horizon; Robertson (1829) and Perkins (1829) kept it horizontal, but inclined to the line of the keel, and the floats being turned at an angle in the opposite direction, entered the water in the usual way. Sharpley (1856) substituted for the wheel and floats a drum carrying a spiral rib; ‡ Belford (1853) put the engine and cargo inside a hollow drum, with floats outside, that propelled it as the drum revolved.

Having thus noticed the paddle-wheel generally, as to when it was introduced, how it was turned, and where it was placed, we may proceed to consider various plans and inventions relating to its several parts, but it is to

be distinctly understood that I refrain from comparing the relative merits of these different suggestions.

Beginning, then, with the shaft and wheel, as a whole, we find that Tremere (1801) and Robinson (1826) supported it on a stage, to be raised and lowered by ropes. For the same purpose Melville (1845) used a cogged sector, and Drake (1851) employed screws;* Coles (1859) supported the shaft on friction wheels.

To enable the engineer to use only one wheel at a time, Gough (1828) put each on the shaft of a separate engine, while in Field's plan (1841) the wheel was disconnected by moving it and the part shaft horizontally. For the same purpose Wilkinson (1835) moved a sliding crank plate along the divided shaft, until the crank-pin locked into it. Brunet (1843) used a sliding ring and bolts; Thomas (1851) employed wedges and a friction cushion. In Seaward's plan (1840) the parts were coupled by friction surfaces, screwed up to close contact. Trewhitt (1840) tightened a friction strap by cutters; Bodmer (1843) and Borrie (1843) used cogwheels; Scott Russell's patent (1853) gearing worked by the motion of the shaft is applied to the *Leviathan*. Price (1823) used intermediate wheels to regulate the relative speed of the engine-shaft and paddle-shaft. The groove and stud apparatus of Parlour (1838) gave the wheel twice the speed of the engine-shaft.†

The modifications of the wheel itself are difficult to classify. Barton (1820), Sang (1852), Belford (1853), and many others, made it a buoyant drum; Stevens (1827) put floats on three arms, not in the same plane. Springs were introduced by Adams (1839 and 1855) to ease concussion. Skene (1827) had side plates on the rims. In Taylor's plan (1840) one wheel might be covered from the water by a shield. Essex (1858), by dividing the wheel horizontally, folded back one part by hinges on the rim; while in Drake's plan (1851) the arms fold on hinges, like a fan. Galloway (1832) and Herbert (1855) attached an additional wheel, by a short shaft jointed to the outer end of the other, so that the rims of the wheels approached under water, and were more apart at the upper edges. Daubeny (1840) made the second outside wheel turn slower than the inner one, but in a parallel plane.

Let us next turn attention to the floats or paddle-boards, and first as to those that are immoveable on the wheel. Floats of the simple rectangular radial form were the earliest in use. Pitot (1729) put floats in planes tangential to the surface of a cylinder on the shaft; Perkins (1829) placed them at an angle to the shaft; Sharpley (1856) aggregated them into one continuous spiral rib; Galloway (1832) used two sets of floats, inclined in different directions; Chatterton (1842) and Stevens (1851) inclined each float in an opposite direction to the next, which projected beyond it at one end. Brooman (1852) put the oblique floats with one end further from the shaft than the other; Carter (1832) put a valve between each pair of inclined floats. This was to let out the backwater, which was effected in Pickworth's plan (1836), by louvre boards in the float, in Elvey's (1837) by a valve, and in Woodley's (1839) by holes bored diagonally through the float. Galloway (1835) divided the float horizontally, and put the parts successively in advance of each other. In Gemmel's plan (1837) the middle part was foremost, and Jones (1847) made the parts to overlap.

The edges of floats were curved by Robertson (1829). Ruthven (1830) made them of a barrel shape,‡ and there

* No description of the machinery of this vessel is given before that published, in 1816, by the Marquis de Jouffroy, who gives a sketch of the steam-boat. A copy of this is in the Great Seal Patent Office Library.

† The Emperor of Japan received a steam yacht, as a present from the Queen of England in 1858. The Chinese now use mock steam-boats, with paddles turned by men concealed inside.

‡ Both these last two methods tend to propel the vessel in a line inclined to the shaft, and, in this respect, their operation is intermediate between those of the paddle-wheel and screw-propeller.

* The connecting-rod had a screw joint, which allowed its length to accommodate itself to the varied distances between the piston-rod and the shaft.

† Murdoch (1839), Brown (1842), and Bodmer (1844), had plans somewhat similar.

‡ Hollow floats were used by Berry (1831), to condense the steam conducted through the arms.

is scarcely any other form which has not been proposed for them at one time or another.*

Floats were made moveable, for reefing, shipping, and feathering. For reefing, Parr (1825) made the floats slide on the arms with joints. Galloway (1843) placed the moveable pieces on a separate inside wheel, moving laterally on a hollow shaft, and Brunet (1843) placed them on different sides of the arm.†

Hall (1839) and Bird (1842) protruded them by a fixed spiral groove. They might be folded on hinges in Tremore's plan (1801), and were worked through screw rods by Holebrook (1838). In Leeming's plan (1835) and Newton's (1843), each float protruded during part of every revolution. Redmund (1838) made them fall back by hinges as they revolved. Each float ran out and in by its buoyancy in Oxley's plan (1845).

The contrivances for feathering floats are numerous. In some cases, each float turns like an oar on a spindle, radial from the shaft, as in Duquet's plan, in 1693, where they feathered by fixed tappets. This was frequently patented afterwards. Two sets of such floats were used by Oldham (1820); Stead (1828) turned them by grooved guides, and Symington (1834) by cog-wheels. But the more common method was to cause the float to feather on a horizontal axis, parallel with the shaft. Silvester (1793) effected this by a spindle turned by a fixed cog-wheel; Broomfield (1825) made the principal cog-wheel adjustable by a screw; Steenstrup (1827) and Brown (1845) used an endless chain to regulate the angles of the float; Holebrook (1832) used a spindle, with a worm at one end and a pinion at the other. Curved rims, or cam-guides, feathered the floats by acting directly on catches, in the plans of Binns (1822), Pool (1829) and Winkles (1840). Parr (1825) caused the pressure of the water to feather the float on an axis dividing it unequally; Binns (1822) loaded the float so as to keep one edge always lowestmost. This mode was repeatedly patented.‡ Skene (1827) combined these two last means, and bridle-bars were added by Vint (1835). Long before this, Lambert, in 1819, kept the free edges of the floats lowestmost by attaching them all to a heavy circular rim without bearings.§ Parlour (1838) feathered the floats by a divided shaft, of which the part attached to the float-spindles turned twice for each revolution of the other part.

In 1813, Robertson Buchanan patented his invention for feathering each float by a spoke from an arm on its spindle, jointed to a rim turning on a fixed excentric.

This application of the excentric was repeatedly patented, in various shapes, and many of the plans are so similar, it is not identical, that it is evident their inventors were ignorant of what had been done before. It is to be regretted that, in many of these cases, from £300 to £500, besides often ingenuity, time, energy, and private expenditure, were thus needlessly thrown away; and it is to be hoped that, by the enlightened policy of the present authorities at the Patent Office, inventive energy will be delivered from a useless repetition of past efforts, and genius will be set free to cultivate new fields of labour.

* Some of these variations of form will be found in the following patents.—Perkins, 1829; Gemmell, Cave, and Hall, 1837; Rennie, 1839; Rascon, 1840; Joest, 1841; Biram, Lander, 1842; Smart, 1843; Handcock, 1844; Cartwright, Blyth, and Parlour, 1845; Barlow, 1851; Flynn, 1852; Scott, 1854; Bellford, 1855; Chatterton, 1855; Parkhurst, 1856; Crooker, 1857. † Massie (1836), dividing each float into parts with parallel bars, caused one set to move over the other for reefing. For attaching the floats Hamond (1844) used wedges, while screws were employed by Brown (1847).

‡ Mercey (1825) tried to make the float feather by buoyancy, and Hill (1825) connected all the floats together by forked jointed pieces.

§ Cochrane patented this ten years afterwards, and Napier did the same in 1841; Miller (1848) added small guide rollers to steady the rim and increase the vertical pressure.

In 1827, Oldham put the feathering excentric on a hollow shaft, embracing the paddle-shaft, and so turned slowly, by fixed cog-wheels, as to cause the side edges of each float to point to the top of the wheel.

Bernhard (1828), Anderson (1828), and Giffard (1837), made the excentric adjustable, so as to regulate the angles of exit and entrance of the floats.*

In Lagergren's plan (1855), the rim on one side was higher than that on the other, and each float revolved on horizontal bearings, placed at its diagonal points.

Pickworth (1836) made each feathering float to consist of a frame carrying louvre boards on vertical spindles.

In Bramwell's plan (1851), an excentric motion and springs caused the arm and float to yield at the beginning of the stroke, and to work at greater angular velocity near the end. Ross (1856) gave to the outside edge of hinged floats a similar variable motion. The paddle floats of the *Leviathan* do not feather.

Among the few patents relating to paddle-boxes, we may notice Cochrane's (1818), for forcing smoke from the furnace into a closed paddle-box partly submerged, so as to exclude the water. Palmer (1839) did this by pumping in air, while Taylor (1848) allowed it to be forced in by the waves. Symington (1835) led the spray from the paddle-box to cool the engine; and the well-known paddle-box boats were patented by Smith in 1838.

We must go back again to early times for the first appearance of the screw-propeller. It is probable that, as the action of a watermill suggested the use of the paddle-wheel, so the motion of a windmill may have prompted the use of the oblique vaned propeller.†

In 1729, Duquet submerged an apparatus like a smoke-jack or windmill, and the action of the stream turned its shaft so as to wind up a rope.

In 1746, Bouguer states that "revolving vanes, like those of a windmill," had been tried for the propulsion of vessels, but it is not clear that the axis was turned by force inside the vessel, or that the method was an advance on that of Duquet.

The use of the screw-propeller in China may be of an indefinite antiquity. A model of one was brought from that country about the year 1780. It had two sets of blades, turning in opposite directions; but the first distinct description of the screw-propeller to be turned by machinery inside a vessel, seems to have been by D. Bernouilli, of Groningen, in 1752, and it is remarkable that this, though the earliest recorded proposal, was well enough matured to comprise the use of oblique vanes at the bow, sides, and stern, turned by a steam-engine, and capable of being hoisted out of the water. The woodcut (next page) representing the inventions of Bernouilli, is copied from one published A.D. 1803, in *Annales des Arts et Manufactures*, Tom. 20, Pl. II., p. 100.

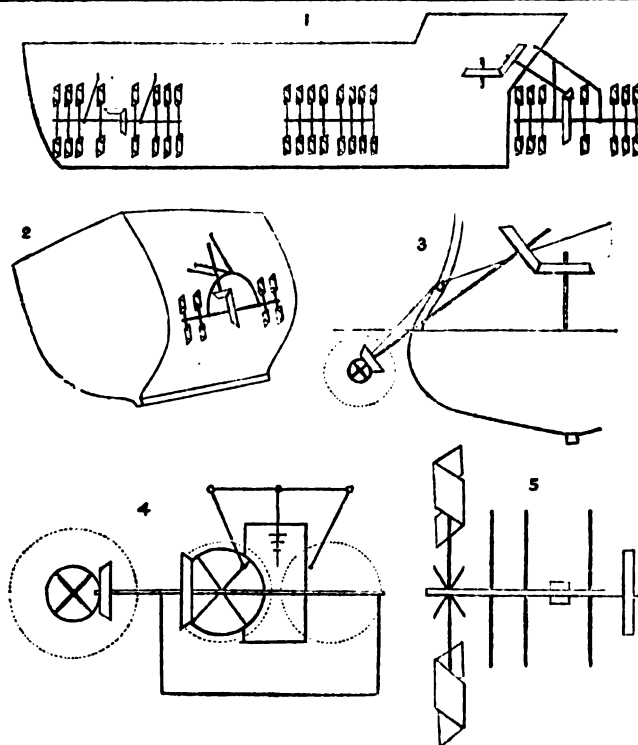
In 1768, Paucelon proposed the pterophore, a screw thread on a cylinder, to be wholly or partly immersed. In 1770, James Watt suggested to Dr. Small the trial of a steam screw-propeller; Bramah, in 1785, first patented a rotary engine for this purpose; Ramsey (1792) put the screw between two hulls, and Lyttleton (1794) used a three-threaded screw, while Fenton (1798) tried one with four blades. Shorter's screw, (1800), with a jointed shaft,‡ and worked by men, was applied in 1802, to H.M. ships *Dragon* and *Superb*. The first screw steamer I can find was tried by Stevens in America§ in 1804. In 1825 Brown used one on the Thames.

* This is done by levers, or by a sector working a framework jointed to the rods that work the floats.

† The windmill is of an unknown antiquity. There is an interesting description of it by R. Hooke, in 1681. It will be observed that under the term "screw-propeller," we include every rotating propeller with oblique vanes which urges the vessel in a direction parallel to the propeller shaft.

‡ Patented again by Phipps, 1850, with a moveable outside bearing, and by many others.

§ Worked first by a rotary engine, afterwards by Watt's reciprocating engine. In this year, 1804, Boaz made experi-



1. Side view of Bernouilli's Screw Propellers at the bow, side, and stern of a vessel.
 2. Three-quarters view of the side propeller.
 3. Stern view of ditto, with a cross section of the vessel.
 4. The steam-engine.
 5. Enlarged view of the propeller.

The only patent for combining the screw-propeller and paddle-wheel is that of Turck, in 1852. The Bee, a naval steam-tender at Portsmouth has carried both paddles and screw since 1842, but they are not worked together.

Screw-propellers are so various in form that we can scarcely arrange them for consideration according to their shapes or modes of action.* It will be better to group the inventions according to the several parts of the apparatus they relate to. And first, with respect to

with the screw. The following information is extracted from the Board of Trade papers:—Total number of steam-vessels registered up to Jan. 1, 1857, 1668, of which there were wooden, with paddle-wheels, 820; with screw propellers, 19, total of wood, 839. Iron, with paddle-wheels, 356; with screw-propellers, 473; total of iron, 829. From the Navy List, we learn that there are at present, in the Royal Navy, wooden steamers with paddle wheels, 67; with screw-propeller, 160; and 185 gunboats. Iron steamers with paddle, 15; with screw, 10; with both paddle and screw, 1. Total number of war-steamers, 427, carrying about 16,000 guns, and of 86,000 horse power. In 1814, there were only 2 steam vessels belonging to the British empire. These had increased, in 1855, to 2,010, of 408,290 tons. The number of steam-vessels has doubled since 1845, and their tonnage increased threefold. The first iron steam-vessel was made in 1822. In 1856, 54 wooden and 175 iron steam-vessels were built, (tonnage 57,573) and 35 of both kinds were wrecked. Within the last 12 years, about 20 large mail packets have been lost. Since 1853, 2,000 persons have perished, and ten millions of dollars worth of property have been destroyed in the wrecks of the United States coasting mail packets.

A general division may be made into two classes. In one (as in the plans of Bernouilli and Bouguer) no thread continues through an entire revolution. In the other a helical thread has at least one revolution (as in the plans of Duquet and Paucton).

the general arrangement of the whole apparatus, there is scarcely any position under or above water all round the vessel which has not been proposed for the screw-propeller; indeed most of these varieties of position were exhausted by the earliest plans.

The first English patent relating to the subject is Miller's, in 1775. Here the blades are at the end of the arms of a windmill on a vessel's deck, with its axis parallel to the keel. Duncan (1851) put the blades on an endless strap, running outside over the deck and round the hull. He suggested also (1856) that a spiral rib, wound round a floating cylinder, should act for propulsion as the cylinder is caused to turn.*

Bernouilli and Shorter, having suggested propellers at the bow, sides, and stern of a vessel, Cummerow, in 1828, placed one in an opening in the stern deadwood, which is now the usual position.

Taylor, again (1838 and 1846), using two propellers on separate shafts, brought them so near that the blades overlapped and passed between each other. Napier (1841) placed one of the approximated propellers astern of the other. Carpenter (1851), put two propellers in separate stern-pieces. Bucholz (1851) had three of them, and placed the middle one astern of the others. In all these cases the shafts were on the same level, but Tombs (1856) placed the shaft of one (the aftermost overlapping propeller) a short distance above the other shaft, to which it was geared,† so as to turn in an opposite direction.

Next, we must notice different propellers on the same

* A similar mode of propulsion used by an insect is noticed near the end of this paper.

† Morrison (1854) placed on a propeller "above the other."

axis. Perkins patented this plan* in 1824, placing one shaft within the other, and turning the screws in opposite directions. Church patented it in 1829, and Ecrisson in 1836, when a hoop with short vanes was used instead of blades.

Such were the positions of the propeller when in use; but it was soon found needful to have a power of altering the position, so as to hoist it out of the way. For this purpose, Bernouilli (1752) put hinges on the rods supporting his side propellers, and detached the propeller from the shaft at the stern.†

In Shorter's plan (1800) the shaft had a universal joint, which allowed the propeller to be raised; Pumphrey (1839) detached the propeller at this joint; Taylor (1838) disconnected the shaft by drawing inwards the engine part, so that the propeller could be raised in vertical guides; Maudslay (1846) used a similar plan, and screwed one part of the shaft into the other, to connect them again; Galloway (1848) and Griffiths (1853) disconnected the whole apparatus by chains, which extricated the shaft from the bearings successively; Seaward (1846) lifted the propeller by rods which were screwed into the boss.‡ The propeller was raised in a different manner by Perkins (1845) and Tucker (1850), who put it on an arm turning vertically round a horizontal pin above the shaft.

Some other inventions relating to the propeller shaft may be briefly noticed. Thus Buchanan (1846) supported the shafts on springs. Montgomery (1846) and Hunt (1854) made it yield to a twisting strain. Wimshurst (1860) and Prideaux (1858) inserted a dynamometer between its parts. Blaxland (1840) put the shaft on a single spherical bearing, so that its inner end could be raised.

Various plans were suggested for receiving the horizontal thrust of the shaft. Hays (1844), Buchanan (1846), and Prideaux (1853), received the end of the shaft in a water-box; Penn (1845) upon a steel plate, revolving so as to present new surfaces to the point; Beale (1848) deflected part of the thrust along other transverse shafts by bevelled wheels. A common groove and furrow bearing is used in the *Leviathan*. Penn (1854) put wood to work on metal for the bearings under water; Buchanan (1854) placed two shafts one above the other, and the propeller could be attached to either as the vessel was loaded; Napier (1856) worked the propeller shaft at different elevations by an adjusting vertical shaft and cog wheels; James (1857) pumped water through it to be discharged at the ends of the blades, and thus to turn them.

To regulate the speed of the shaft, (Galloway (1848) had a multiplying gear of bands and wheels. Maudslay (1843) used drums and an endless rope. Hays (1844) inserted an additional shaft and cogwheels, while Griffiths (1849) applied the sun and planet motion. Robertson (1856) used grooved friction wheels, and Struthers (1856) geared one shaft to the other by a cog wheel with internal teeth. Bodmer (1844) caused the propeller to turn with a velocity, alternately increasing and decreasing. Hunt (1854) connected the shaft with the throttle-valve, so that the steam was regulated by the degree of pitch of the blades; Roberts (1851) made the boss much larger than usual; and Griffiths (1849) tapered its after end to a conoidal point, and other forms

of the boss were applied in connection with moveable blades.

The forms proposed for propeller blades, both for outline and section, are innumerable. It is hoped that in noticing only a few, no injustice will be done to the other twists and curves and fanciful forms, so many of which remain unknown to fame.*

We shall direct our attention first to blades not moveable on the shaft. In 1825, Marestier had a screw of a "helical surface." Woodcroft (1832) patented a propeller with an increasing pitch,† Smith (1836) used two threads of a half turn each at the ends of a diameter.

In the plans of Lowe (1838) and Borrie (1843) each blade revolves in a different plane. Haddon (1839) fixed two spirals at a distance from the shaft; Poole (1848) patented the "Bommereng" propeller, in which a bent blade turns about its centre of gravity in the shaft; Joest (1841) shortened every alternate blade; Dundonald (1843) bent them towards the stern; Griffiths (1849) towards the bow, or alternately each way.

Samuda (1848) put the blades projecting inwards from a hollow drum. The surface they presented was made elastic in the plans of Duncan (1816), Macintosh (1847), Hendryckx (1850), and Hunt (1854). Oxley (1845) made it expandible by wedge pieces. Amongst other forms were Sunderland's (1843), and Southworth's (1846), bounded by areas of circles; Griffiths' (1849) open in the centre, or with blades like lancets,‡ and Lowe's (1852) with an indescribable twist.

The blades were made moveable on their radial axes in the boss by Millington, in 1816.

Woodcroft (1844) effected the adjustment by a rod lying along the shaft, jointed at one end to a short arm on the blade, and carrying at the other end a stud, which takes into a groove in a short box or hollow piece, traversing the shaft on feathers.§

Woodcroft, in 1851, used another form of boss, by which the blades could be so turned on their axes, while the shaft revolved, as to operate on the water with their reversed sides, and thus to back the vessel without stopping the engines.

Hays (1844) altered the blade's angular position by screwing up a ring. Bodmer (1844) placed one pair of blades loose on the shaft, so as to be properly set as they revolved, and to rest vertically behind the false stern-post. For the like purpose Malo (1850) put the pairs of blades on different shafts, one being hollow.

Buchanan (1846) made the water turn the blade on its radial axis, and fixed it by clutches.

Wingate (1857) turned the blade by a key, and fixed it by the friction of its conical shank in the boss.

In 1849, Griffiths caused the pitch of the blades to be altered by levers, according to the speed of the shaft. Burch (1852) substituted a large plate for the boss, and the blades thus projected beyond the ordinary hull lines

* The propeller blades of the *Leviathan* are fixed, and of a common form.

† A right angled triangle, wound upon a cylinder, traces a screw by its hypotenuse. When a spiral curve is put instead of the hypotenuse the screw will have an increasing pitch. Fraissinet (1838) used a parabolic curve, and Rennie (1839) applied another curve. Beadon (1845) and Templeton (1846) made the blades of a volute form—Rosenberg (1845) reversed the usual curvature, by making the blade near the boss parallel to the shaft.

‡ Griffiths (1849) proposed to determine the best form of curved blade by using balls floating in the wake of the propeller, so as to indicate the forces acting at different points by spring balances.

§ A full-sized model of this plan is placed in the Patent Museum, at Kensington. In 1851, the same patentee used a hollow shaft with a cog wheel acting on a pinion on each blade. The plans of Hays (1845) and Brown (1847) were nearly similar.

|| Griffiths (1853) adjusted the blades from the deck by a key working a bolt in the boss.

* The Chinese propeller seen by Col. Beaufoy, in 1780, had two screws turned in opposite directions, but they may have had separate axes. The plan of Perkins was patented afterwards by Smith (1838). Dugdale (1849) put several propellers on the same shaft.

† Others left the propeller free to revolve as the vessel sailed. Slaughter (1849) helped it to do so without resistance by a "donkey engine."

‡ Wimshurst (1850) used a similar plan, and disconnected the parts by withdrawing bolts; Wilson (1852) caused the propeller to be hoisted by screwing itself along the inclined shaft; Oxley (1845) enclosed the space occupied by the propeller (when at rest vertically) with water-tight doors, in a chamber kept dry by compressed air.

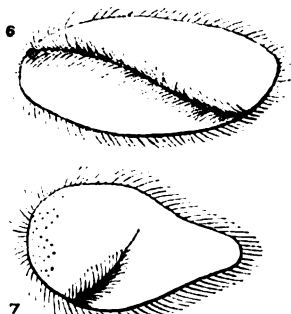
of the stern, which were continued aft beyond the propeller. Paterson (1857) produced a similar effect by using for the boss a large conical drum, coinciding at the foremost end with the shape of the vessel, which was terminated by a round vertical plane.

The screw-propeller was caused to steer the vessel by altering the direction of the shaft or the angular position of the blades. Shorter (1800) and Millington (1816) used the first plan, turning the shaft to one side or another by a Hooke's joint. Pumphrey (1829), Buchanan (1853), and Abadie (1854), attached the shafts to a frame moveable laterally with the rudder; and Bucholz (1851) geared each of his three propellers in a ring, which allowed the axis to be directed for steering.

The second mode of steering was adopted by Woodcroft (1851), who attached each blade by an arm to a rod with a stud in the groove of a box on the shaft inside the vessel. The direction of the groove could be so altered by switches as to cause the blade to act with its broadside during one part of each revolution, and thus to impel the stern to one side or another. When the blades were stationary, in a vertical position, they might be turned on their axes, so as to act like an ordinary rudder.

Foulevton (1844) and Wimshurst (1850) placed a screw on an axis athwart the vessel, so as to steer by revolving in one or the other direction.

In the modes of propulsion adopted by aquatic animals may be found almost every plan which has been used by man with machinery. Thus water is ejected for propulsion by the cuttle fish and "paper nautilus;" sails are used by the veleva and water birds; punting and towing by whelks and the lepidosiren; a folding paddle by the lobster, feathering paddles by ducks, and oblique surfaces by fish of all kinds. A screw-like appendage is found in the wings of an Australian fly, but it is supposed to be shaped thus only when dried after death. There is, however, one remarkable animal which propels itself by a rotary movement, acting on the water by means very similar to those of the paddle-wheel and screw-propeller combined. This is the infusorial insect *Paramecium*. My attention was called to this miniature Leviathan by Mr. Robert Mallet, and after some months of ineffectual search, I was fortunate enough to see its operations distinctly in one of Mr. Tomkins' splendid microscopes. The form is represented in the accompanying woodcut. A sulcus or furrowed groove



6. *Paramecium Caudatum*. (Ehrenberg, Taf. 39, and pp. 351, 353.)
7. *Paramecium Compressum*.

runs obliquely round the oval-shaped body of the animal (in one variety it is only near the stern). A wave-like protuberance passing along this sulcus (with or without cilia) causes the body to rotate on its longer axis, and thus propels it as by the fore-and-aft stroke of a paddle, as well as by the screw-like progress induced by the spiral groove.

The coloured diagrams around us show, without verbal explanation, the gradual progress of marine propulsion from the early days of Nineveh, Babylon, and Egypt. We have traced its more particular application

in the rotatory action of the paddle-wheel and screw, and have seen these combined in one of nature's smallest works. Let us hope that the giant vessel now afloat will be a great success, bearing forth our sturdy emigrants to lands of plenty—honest English hearts to shores of commerce—strong hands to works of industry—strong minds to stores of knowledge—brave armies to fields of glory—and the gospel of peace to the ends of the earth.

DISCUSSION.

The CHAIRMAN said he was sure they had listened with pleasure and profit to the admirable paper of Mr. MacGregor, which could not fail to be useful in assisting inventors to avoid wasting their energies in inventing over again that which they would probably find had been invented before. He feared it was not generally believed that the faculty of mechanical invention was not a very unusual faculty—that it belonged to nearly everybody, and that it was one of the greatest misfortunes that could fall upon a man when he took it into his head that he was endowed with a larger portion of that faculty than anybody else. He could assure them that that was the thing which practical engineers were most afraid of in themselves. They had to be constantly guarding themselves against the temptation to invent, for it was a much safer course to be contented with exercising their judgment on the inventions of others. Invention, then, in mechanics, he did not think at all a distinguishing faculty; and he believed there were men in this country who could invent anything they were asked for, and all we had to do was to pay them for inventing. Therefore, he advised most people not to invent, but to pay other people, who had nothing else to do, to invent for them; they would find it much cheaper. Of the hundreds of inventions that had passed through Mr. MacGregor's hands in the extensive research he had had undertaken in preparing this paper, were they not amazed to see how few were at this day in practice; and were they not struck with the fact that nearly all the inventions they now heard of no more seemed monstrosities ingenious, whilst the inventions actually in use were those which appeared to have got rid of all the ingenuity, and to have merely retained one or two plain, simple, common sense elements in them. Now, that was the lesson which he would wish Mr. MacGregor's paper to have taught to that audience, especially the younger members, and that was the lesson he hoped it would teach to the mechanical world at large in the wider sphere of its influence when published in the *Journal of the Society*. There was another very good rule which might be laid down, and that was that no man should set about inventing anything but what had reference to his own trade. He remembered a person coming to him and saying, "I wish you would find a situation for my brother on a railway or steam-boat, or anything else that you are connected with." He asked him what his brother was, and he replied that he was a portrait painter, while he himself was a house painter; and he (Mr. Russell), then asked him why he thought his brother would be more useful in one of the occupations he had mentioned, rather than in assisting him in house painting, which he (Mr. Russell) thought was more closely allied to portrait painting. He, therefore, humbly suggested this to him, as being better and more appropriate than an employment either on a railway or a steam-boat; to which his Scotch applicant replied, that his brother might do very well for a railway, or a steam-boat, or anything else, but he would never make a house painter. He continually had gentlemen coming to him and inventing for him something to assist him in his business, of which they began by telling him they knew absolutely nothing, and when, in return, he ventured to suggest the propriety of devoting a little of their spare time, which they devoted to his trade, to the making of better shoes on cost.

which might be their own business, he was sorry to say he was treated with the greatest disdain for presuming to give advice in a matter of which, of course, he knew nothing whatever. He had now to ask gentlemen whom he saw present to give them any additional facts on this subject that they might be acquainted with, and he would merely set the example by stating that, previously to the year 1830, he saw a steam-boat propelled by the screw, and it reached a speed of from 5 to 6 miles an hour. The results were communicated to the Admiralty, prior to 1830, by the late Mr. Adams, of Edinburgh, and there was a commission appointed to investigate the subject, who reported upon it unfavourably. With reference to Mr. MacGregor's researches, he thought the public was very much indebted not only to him, but also to Mr. Bennett Woodcroft, of the Patent Commission, who had, for the first time, made the vast stores of ingenuity deposited in the Patent-office accessible to the public at large, and who had also formed the nucleus of a Museum of Inventions, which he had no doubt, within the next five-and-twenty years, would be one of the most remarkable and interesting institutions in the British empire. That museum was now partly collected in the Patent-office in Chancery-lane, and partly at the Kensington Museum. The Society of Arts had endeavoured to assist in obtaining some large public building to be set apart for collections of models and records of inventions, in order that inventors might at a glance see all that their predecessors had done. He thought, perhaps, Mr. MacGregor was not aware that a propeller had been introduced by Mr. Rennie, in which he used a diamond-shaped or triangular float instead of a parallelogram, and some advantages were said to result from this arrangement.

Mr. GEORGE RENNIE said, although he did not class himself amongst those unfortunate inventors who had thrown away their time in useless inventions, yet he could not but confess that he had been somewhat of a dabbler in invention. His first notions of screw propulsion were not come to by chance, but were arrived at after mature consideration of the question. While he was trying experiments on the resistance of water, he found that on revolving two square boards through the water, at the extremities of radii, they presented a certain resistance, which was as the squares of their velocities. It was clear that the outer portion of these floats moved with a greater velocity than the inner portion, and that consequently there must be a point between these two which would represent the centre of resistance. He reasoned upon that, and the conclusion he came to was, that he would obtain an advantage by taking off a portion of the inside of the float. He therefore took off two corners of the square, and caused it to revolve in the water, and he found the resistance to be as great as before. He ultimately arrived at a form much resembling the duck's foot—a triangle; thus following one of the most perfect adaptations of nature. The same principle was seen in the formation of the wings of birds and the tails of fishes, and it was found that the more acute the tails of the fishes and the wings of birds were, the faster they moved. Mr. Rennie added that he had had the satisfaction of seeing his discoveries taken up by no less a person than Mr. Ewbank, of New York, who made a series of experiments with the various forms of floats, and found that the triangular floats, in whatever position they were placed, exercised the greatest power in propulsion. His next attempts were directed to the screw propeller, and it occurred to him that the object of the screw was not merely to drive the vessel through the water, but that it should also be of such a form as to pass the water easily. Mr. Rennie concluded with a description of a screw propeller which had been designed by himself, called the "Conoidal Propeller."

Mr. GRANTHAM felt great pleasure in responding to the invitation of the Chairman, although he feared the little he could say upon the subject would not be of any

great interest to those present. It was true he was early engaged in the investigation of this subject. He was much interested by and fully concurred in the very excellent advice which the Chairman had given to the class of people who looked upon themselves as inventors. It so happened that he (Mr. GrantHAM) occupied a position in Liverpool similar to that of the Chairman and other gentlemen in London, and he was frequently called upon to give similar advice. Inventors often came to him with some adaptation as they called it, of the laws of nature applied to mechanics—the fish's tail, the duck's foot, or something of that sort, and they argued that their plan which was an imitation of one of those organic structures must be a good one because it was the plan which the Almighty had adopted in forming those creatures and in adapting their organisation to the sphere of existence in which they were placed. He thought this question was simply set at rest by the reflection that if the fish's tail was the best propeller, why had the Almighty formed the duck's foot to be used for this purpose? and if the duck's foot was the best propeller because it constituted a feathering float, why had the Almighty also formed the tail and the fins of the fish to answer the purposes of propellers? He had no intention to treat this subject lightly, but he said this in order to check the propensity which so many persons had to run wild on those matters. He had been very much interested by the paper of Mr. MacGregor, but there were one or two points in it in which he thought the inquiry might be extended a little further. With reference to the paddle-wheel, Mr. MacGregor was, perhaps, not acquainted with an American invention that had been applied to one or two large vessels, but as it came so soon before the introduction of the screw it succumbed to that, which was now generally held to be the best method of propulsion. This plan consisted of submerged paddle-wheels, which corresponded, in some measure, with Galloway's invention of the water-tight paddle-box. There were two small wheels on the sides of the ship completely submerged. The paddle-boxes were water-tight in all parts except at the bottom. The wheel itself was formed of a closed drum or cylinder, with floats on the outer periphery. The wheels were set in motion by a shaft going through the ship's sides, and being made to revolve at a moderate speed, it was found that the centrifugal force at the periphery of the wheel was sufficient to exclude all the water from the inner part of the paddle-box, so that the whole effort was in the right direction for driving the ship—at the bottom part of the floats. With reference to the screw, his attention was, at first, more particularly directed to the means of driving the screw rather than to the form of the screw itself, and this was a very important element in screw propulsion. In 1843 he read a paper before the Institution of Civil Engineers, descriptive of a small vessel, called the Liverpool screw, which had been built, he believed, in the previous year, and in which, for the first time, the screw was driven in a simple manner direct from the engines. Many interesting experiments were made with that vessel. It was the subject of several evenings' discussion before the Institution, and it would surprise them to hear that at that time there was scarcely one out of the whole number of eminent engineers there assembled, who thought it feasible to drive a screw direct from the engines. That was in 1843. Of course they were all aware now that the prevalent mode of driving the screw was direct from the engines, as it was not only found to be perfectly feasible, but also, he believed, the simplest and best plan. The results of the experiments with that vessel were extremely interesting, although they were not much noticed at the time. He might mention that the same vessel was still at work, and having been lately through his hands was found to be in excellent order. There was one interesting feature which he mentioned at the time his paper was read, which he had not seen noticed in any of the experiments with the screw-propeller. The

trial was made in the Mersey in fine weather and smooth water. The vessel was first driven at full speed a-head, and then stopped suddenly and the engines reversed. It was then found that the vessel, as is usual in screw propulsion, swung round several points, until she begun to make stern way, when she immediately began to steer as before and kept on perfectly straight. It was then a prevalent idea that the lateral motion of the screw would act very much against the steering of the ship, and that a loss of power, and, consequently, of speed would result. As the vessel was very light, by trimming her with some pig iron, at least one-third of the screw was raised out of the water, and when it was in that condition he again tried experiments as to the steering qualities of the ship. The result was that when she was under way he could, with one finger on the spoke of the wheel, easily steer her in any direction, showing how very little oblique action there was in a well-made screw, when the vessel was in motion; and this was also shown in the before-mentioned experiment of reversing, which proved that while the vessel was going in an opposite direction to the screw there was an immense lateral action, which caused the vessel to swing round, but when the vessel moved in the same direction as the screw the effect was altered. This went to show that the lateral action ceased to a great extent when the ship was going with the screw, and that the fears as to the loss of power in the screw were to a great extent groundless.

Mr. CHARLES ATHERTON thought they must all be struck with the remarkable manner in which Mr. MacGregor had verified the old proverb, "There is nothing new under the sun." The only point on which he would offer any observations was, that although in times past there had been such an immensity of invention yet it had lain dormant, and it seemed to be the province of the present age to utilise those inventions which for so long a time remained unknown. It was remarkable that amidst the numerous kinds of screw which had been invented, it was impossible for any one at the present day to say which was the best. In the position which he occupied, a great many different plans of screws naturally came under his notice, and he might have had particular fancies with regard to some of them; but generally speaking mere individual opinions were wrong, inasmuch as some essential point of an invention was often overlooked. He might instance the screw introduced by Griffiths. When that was first introduced, the general opinion was, that width at the end of the screw was desirable in order to gain power; but in Griffith's screw the fan was nearly the shape of a heart. Although that was the reverse of what they had supposed to be a necessary condition of a screw, still he was not prepared to say that it was inferior to any other form of screw; and he even believed it was in a position to compete successfully with any other. He did not appear as the advocate of any particular screw, but he contended that practical experience alone must decide the question of superiority. When they came to the practical part of the question, he thought it was very desirable that engineers should fix some standard by which to judge as to what should be regarded as a really reliable experiment, so that they should be able to discern between a good result and a bad one, which certainly was not the case in the so-called trial trips of the present day. He also thought it very desirable that proprietors and agents of screw steam vessels should furnish engineers with the statistics that they had in their possession, and which were necessary to the investigation of these points. By so doing they would not only promote the advancement of science, but at the same time further their own private interests.

The CHAIRMAN said it was now his duty to propose that they should return their warmest thanks to Mr. MacGregor for his admirable paper, which was so well calculated to promote the advancement of manufactures

and mechanical invention, and to thank him also for the very valuable services which his laborious researches on this subject, and his judicious elucidation of the relation of these inventions to one another had conferred upon mechanics in general, and especially upon those younger men who were growing up as mechanics, to whom we must look for the carrying out of inventions in the next generation as successfully, and, he hoped, still more successfully, than they were carried on in the present generation.

The Earl of CAITHNESS had great pleasure in seconding the motion. When they considered how much ingenuity had been bestowed on such a variety of screws and floats, it was almost surprising to find that any attention was paid to the accommodation of passengers and merchandise. But so admirable were the arrangements of the present system of marine propulsion, that not only was ample accommodation afforded for passengers, but very large space was secured for merchandise, whilst a speed had been attained on the ocean which a few years ago was thought to be impossible. He recollected when Mr. Taylor first proposed to Mr. Miller, of Dalswinton, to put an engine into a boat, the idea was laughed at, but after consideration Mr. Miller yielded to the request, and the engine was furnished by Symington. The vessel was tried, and the beautiful picture of Dalswinton on the table was evidence, if any were wanted, that such a thing took place. The steam-engine, as applied to vessels, had gone on progressing from year to year until we were not contented with the small vessels afloat, but had now to contemplate its application to the immense ship which had been built by his friend Mr. Scott Russell; and he was sure that all present most earnestly hoped that she would turn out a success, and would prove to be the finest vessel afloat. The magnitude of this vessel was such, that although her commander and many naval officers, as well as her projectors, entertained not the slightest doubt of her success, yet, as a hitherto untried experiment upon so grand a scale, the result would be looked to with the deepest interest by all. It was easy for the Chairman to recommend people not to invent, but the difficulty was for any one to keep himself from inventing. They might almost as well tell people not to think, as tell them not to invent. At the same time he considered that Mr. Scott Russell had given them all very excellent advice, and he (Lord Caithness) would join in the advice given—that before they began to invent they should ascertain whether the same thing had not been invented before. He could speak from his own knowledge and experience that when he thought he had conceived some grand idea, he often found it had been given birth to many years before. He thought they were not only obliged to Mr. MacGregor for his admirable paper, but they were also indebted to Mr. Scott Russell for his wholesome advice and his conduct in the chair.

A vote of thanks was then passed to Mr. MacGregor.

The Paper was illustrated by a very large number of sketches and diagrams, made by Mr. MacGregor, as well as by numerous models, kindly lent from the Museum of the Commissioners of Patents.

At the conclusion of the discussion, Mr. C. Wentworth Dilke, Chairman of the Council, announced the decision of the Council in reference to the intended Exhibition of Industry and Art in 1861, and read the resolutions given on the first page of the present number of the *Journal*.

The Secretary announced that on Wednesday evening next, the 21st inst., a Paper by Mr. C. W. Siemens, "On the Progress of the

Electric Telegraph," would be read. On this evening, Mr. W. R. Grove, Q.C., F.R.S., will preside.

MIDDLE CLASS EXAMINATIONS.

The University of Cambridge have issued the following Regulations for the year 1858 concerning the Examination of Students who are not members of the University:—

There will be two Examinations, commencing on Tuesday, December 14, 1858; one for students who are under 16 years of age, and the other for students who are under 18 years of age.

Students will be examined in such places as the Syndics, appointed by the University, may determine.

After each Examination the names of the students who pass with credit will be placed alphabetically in three honor classes, and the names of those who pass to the satisfaction of the Examiners, yet not so as to deserve honors, will be placed alphabetically in a fourth class. After the name of every student will be added his place of residence, and the school (if any) from which he comes to attend the Examination.

In determining the classes, account will be taken of every part of the Examination; but no credit will be given for knowledge in any subject, unless the student shows enough to satisfy the Examiners in that subject. Regard will be paid to the hand-writing and spelling throughout the Examinations.

The students who pass with credit, or satisfy the Examiners, will also be entitled to receive certificates to that effect. Every certificate will specify the subjects in which the student has passed with credit, or satisfied the Examiners, and the class in which his name is placed.

Every one admitted to Examination will be required to pay a fee of twenty shillings.

EXAMINATION OF STUDENTS WHO ARE UNDER SIXTEEN YEARS OF AGE.

Students must be under 16 years of age on the day when the Examination begins.

PART I.—PRELIMINARY.

Every student will be required to satisfy the Examiners in

1. Reading aloud a passage from some standard English prose author.
2. Writing from dictation.
3. The analysis and parsing of a passage from some standard English author.
4. The first four rules of Arithmetic, simple and compound, Vulgar Fractions, Practice, and the Rule of Three.
5. Geography:—Every student will be required to answer questions on the subject, and to draw from memory an outline map showing the coast line, the chief ranges of mountains, and the chief rivers of one of the countries in the following list:—England, Scotland, Ireland, Europe, Asia, Africa, North America, South America, Australasia.
6. The outlines of English History since the Conquest; that is, the succession of Sovereigns, the chief events, and some account of the leading men in each reign.

PART II.

The Examination will comprise the subjects mentioned in the following ten sections: and every student will be required to satisfy the Examiners in three of those sections at least, but no one will be examined in more than six. Section I. must be one of the three, unless the parents or guardians of the student object to his examination in that section.

1. Religious knowledge: Questions will be set on—

(a) The two Books of Samuel, the Gospel of St. Matthew, and the Acts of the Apostles:

(b) The Church Catechism:

(c) Whateley's "Easy Lessons on Christian Evidences."

Every student, who is examined in this section, will be required to satisfy the Examiners in the subject marked (a), and in one at least of the subjects marked (b) and (c).

2. English:—Every student, who is examined in this section, will be required to write an original English composition. He will also be examined in English History, from the battle of Bosworth field to the Restoration: Physical, Political, and Commercial Geography: Trench, "On the Study of Words."

3. Latin:—Passages will be given from Sallust's "Bellum Catilinarium" and Virgil's "Æneid," Book VI, for translation into English, with questions on the parsing and the historical and geographical allusions: Also an easy passage for translation from some other Latin author: And a passage of English, with Latin words supplied, for translation into Latin.

4. Greek:—Passages will be given from Xenophon's "Anabasis," Book II., and Homer's "Iliad," Book VI., for translation into English, with questions on the parsing and the historical and geographical allusions: Also an easy passage for translation from some other Greek author.

5. French:—Passages will be given from Voltaire's "Charles XII.," for translation into English, with questions on the parsing and the historical and geographical allusions: Also a passage from some modern French author for translation into English: And easy English sentences for translation into French.

6. German:—Passages will be given from Lessing's "Fables," prose and verse, for translation into English, with questions on the parsing: Also a passage from some modern German author for translation into English: And easy English sentences for translation into German.

7. Pure Mathematics:—Every student, who is examined in this section, will be required to satisfy the Examiners in Euclid, Books 1 and 2, Arithmetic, and Algebra to simple Equations inclusive. Credit will be given for a knowledge of Book-keeping. Questions will also be set in Euclid, Books 3, 4, and 6, in Quadratic Equations, Progressions, Proportion, Plane Trigonometry not beyond the solution of Triangles, the use of Logarithms and Mensuration.

8. The elementary principles of Mechanics and Hydrostatics:—Questions will be set, embracing the proofs of the leading Propositions. In Mechanics they will not extend beyond the parallelogram of forces, the centre of gravity, and the mechanical powers. In Hydrostatics they will not extend beyond the transmission of fluid pressure, the equilibrium of inelastic fluids and of floating bodies, and the description of the steam engine and of simple hydraulic machines. A fair knowledge of Mechanics will enable a student to pass in this section.

9. Chemistry:—Questions will be set on the elementary facts of Chemistry, and the laws of chemical combination. Solutions will be given to be tested, containing not more than one acid and one base.

10. Zoology and Botany:—Elementary questions will be set on the description and classification of animals, their habits and geographical distribution; and on the mercantile and industrial uses of animal products: Also on the description and classification of Plants, their uses and geographical distribution: British plants and parts of plants will be given for description.

PART III.

Students may also offer themselves for Examination in

1. Geometrical and Mechanical Drawing.

2. Drawing from the Flat, from Models, from Memory, and in Perspective.

3. The Grammar of Music.

SECTION H.

The grammar of Music.

The history and principles of Musical Composition.

A knowledge of the elements of Thorough Bass will be required, in order that a student may pass in this section.

Local Committees, wishing to have Examinations held in their several districts, may obtain all necessary information from the Vice-Chancellor of the University.

Applications on behalf of Students desiring to be examined at Cambridge must be made on or before November 1, 1858.

Applications from Local Committees for examinations to be held in their districts must be made on or before October 1, and the probable number of students to be examined must be then stated. The names of such students must be sent to the Vice-Chancellor on or before November 1858, together with statements of the subjects in which they will offer themselves for examination.

The fees for all students must be paid on or before November 1, 1858.

SOUTH KENSINGTON MUSEUM.

During the week ending 10th April, 1858, the visitors have been as follows:—Morning, 9,195; Evening, 6,223. Total, 15,418.

Home Correspondence.

ALUM IN BREAD.

SIR,—Permit me to state that during the last few months I have been professionally employed to examine bread obtained from various London bakers, especially with reference to its containing alum, and that, out of some sixteen samples examined, I have in no case been able to detect the presence of more than a minute trace of alumina.

As the processes which I employed for the detection of the alum were the imperfect ones commonly in use by chemists—Kuhlmann's, for example—no doubt even the minute traces of precipitate which I obtained, and which are generally supposed to be alumina, really consisted partly, if not entirely, of phosphate of lime and phosphate of magnesia. I should certainly have determined this point definitively, by submitting the precipitates to analysis, had I obtained them in sufficient quantity.—I am, &c.

RICHARD V. TUSON, F.C.S.

Oxford-court, Cannon-street, E.C., April 15th, 1858.

MEETINGS FOR THE ENSUING WEEK.

- Mon.**United Service Inst., 84. Capt. Fishbourne, "On Floating Batteries."
- Tues.**Royal Inst., 3. Mr. J. P. Lacaita, "On the History of Italy during the Middle Ages."
Syr-Feyzulan, 74. Anniversary.
Civil Engineers, 8. Discussion "On Hydraulic Mortar." And, if time permits, Mr. J. Brunlee, M. Inst. C.E., "Iron Viaducts over the Rivers Leven and Kent in Merceam Bay," and Mr. R. J. Hood, M. Inst. C.E., "On Railway Stations."
Statistical, 8. Mr. Lumley, "On the Administration of the Poor Law in the Metropolis."
Pathological, 8.
- Wed.**United Service Inst., 3. Dr. Bird, "On the Principles of Military and Naval Hygiene, necessary for practically improving the Sanitary Condition of British Soldiers and Sailors at home and abroad."
Royal Soc. Lit., 4. Anniversary.
London Inst., 7.
Society of Arts, 8. Mr. C. W. Siemens, "On the Progress of the Electric Telegraph."
Microscopical, 8.
- Thurs.**Royal Inst., 3. Prof. Tyndall, "On Heat."
Royal Society Club, 6.
Mendhamatic, 1.
Physiological, 8.
Royal, 84.

- Fri.**Antiquaries, 2. Anniversary.
United Service Inst., 3. Capt. Scott, "On the Topographical Survey of a small extent of Country."
Royal Inst., 84. Col. H. James, "On the Geodetic Operations of the Ordnance Survey."
Sat.Royal Inst., 3. Mr. E. Lankester, "On the Vegetable Kingdom in its relations to the life of man."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, April 9, 1858.]

- Dated 6th Feb., 1858.*
221. T. Warakine, Russia—Sorting corn by its weight by means of a special machine, called "specific corn sorting machine."
- Dated 11th March, 1858.*
488. R. Roberts, Manchester—Imp. in mechanism for engraving and otherwise copying in line, paintings and other designs on fat and curved surfaces of metal, paper, and other materials.
- Dated 13th March, 1858.*
514. J. Jameon, 10, Catherine-terrace, Gateshead—Imp. in apparatus for compressing and expanding aeriform fluids.
- Dated 15th March, 1858.*
520. B. Edwards, 1, Single-street, Canal-road, Mile-end-road—Imp. in preparing and combining materials used in lighting or kindling fires.
- Dated 16th March, 1858.*
550. L. E. Fletcher, Upper Norwood—Imp. in marine engines and boilers, and their appurtenances.
552. C. Doley, Birmingham, E. Bignand and T. H. Worrall, Smethwick—Imp. in ornamenting metals.
554. Sir J. C. Anderson, Bart., Farnley—Imp. in locomotive and other carriages.
556. T. Stiffell, Hermondey—Imp. in pumps, especially adapted for ships' purposes.
558. T. S. Sutton, Glynaleiros, Neath, Glamorganshire—Imp. in miners' lamps.
560. A. V. Newton, 66, Chancery-lane—An improved process of polishing, bluing, and annealing articles of iron and steel. (A com.)
562. J. A. J. Redler, Paris—An improved chronometer, called "chronoscope."
- Dated 19th March, 1858.*
564. H. Brocklebank, Coventry—Imp. in chronometers, watches, and timekeepers.
566. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—Certain imp. in the production of motive power. (A com.)
568. G. Williams and E. Rowley, West Bromwich—An imp. or imps. in piling iron.
570. J. M. May, Lambeth-hill—Imp. in fastenings for portmanteaus, travelling bags, ladies' companions, cigar, writing, and instrument cases, fuse boxes, and other like cases or receptacles. (A com.)
572. G. F. Muniz, Frenchwells, near Birmingham—Imp. in mixing zinc with copper and other metals.
574. J. Bramwell, Buxton, Derbyshire—Imp. in apparatus for the prevention of accidents arising from the escape of gas.
- Dated 20th March, 1858.*
576. W. Haigh, Reddih, Lancashire—Imp. in the manufacture of a certain description of paper, and in the machinery connected therewith.
578. P. M. Parsons, Duke-street, Adelphi, and W. Dempsey, Great George-street, Westminster—Imp. in the construction of switches and crossings for railways.
580. J. Brooks, Elton, near Bury—Imp. in drawing frames used in the manufacture of cotton and other fibrous materials.
582. P. Browne, Liverpool—Imp. in the screw propeller, partly applicable to the raising of fluids.
584. W. Allen, Arthur-street, Coventry-road, Birmingham—Imp. in machinery for manufacturing screws.
586. A. V. Newton, 66, Chancery-lane—Imp. in sewing machines. (A com.)
- Dated 22nd March, 1858.*
590. R. A. Brooman, 168, Fleet-street—Imp. in apparatus for exhibiting daguerreotype, photographic, and other stereoscopic views and pictures. (A com.)
591. E. J. Manwaring, Lee, Kent—Imp. applicable to stereoscopic apparatus.
592. J. Thomas, Hackney—Imp. in machinery for counting, and registering or paging.
593. C. C. Bailey, Manchester—An improved method of supplying the feed water to boilers, and in the apparatus connected therewith.
595. J. Jukes, Dame-street, Wharf-road, City-road, Islington—Imp. in apparatus for supplying coals to stoves and fireplaces.
597. I. Holden, St. Denis, and E. Hubner, Mulhouse, France—Imp. in preparing, heckling, or combing fax, silk, wool, and other fibres.
599. H. A. Jowett, Sawley, Derbyshire—Imp. in machinery for transmitting telegraphic communications and making signals, applicable to railways and other purposes.

Dated 23rd March, 1858.

609. H. L. Muller, Paris—Imp. in chromographic printing.
 601. C. Atherton, H.M. Dockyard, Woolwich—Imp. in furnaces, fire grates, and stoves.
 602. A. S. Stocker, 18, Wimpole-street, Cavendish-square—Imp. in the manufacture of railway axles and tubes.
 603. W. Mould, Bolton—Imp. in machinery or apparatus for preparing and spinning fibrous materials.
 604. J. Rowbottom and T. Standeven, Halifax—Imp. in washing, wringing, and mangling machines.
 605. W. E. Wiley, 34, Great Hampton-street, Birmingham—Imp. in ever-pointed pencils.
 606. C. Clifford, Inner Temple-lane—Imp. in ships' davits, and in apparatus for stowing, lowering, and securing boats.
 607. E. Coulon, Croisset, near Rouen, France—Imp. in preventing the incrustation of steam boilers. (A com.)
 608. W. S. Keith, York-street, Southwark—An improved rotary cutting machine.
 610. C. F. Quintin, Cheltenham—A kneading machine.
 611. W. Ramsell, Deptford—Imp. in furnaces and fire-places.
Dated 24th March, 1858.
 612. J. C. Wilson, 11, Soley-terrace, Pentonville—An improved method for introducing elastic substances into articles of wearing apparel, and the adaptation thereof to the manufacture of certain useful garments in which elasticity is required.
 613. R. Jackson, Calder-vale, Garstang—Imp. in machinery or apparatus for spinning cotton and other fibrous substances.
 614. H. Gerner, 10, Newton-road, Baywater—Imp. in apparatus for the manufacture of gas from oils or fatty or resinous matters.
 615. C. Chevallier, M. I. Olivier, and E. Rolland, Brussels—A machine for making and applying as soles to shoes and boots, gutta percha, caoutchouc, and other analogous substances adapted for that purpose.
 616. M. A. F. Mannois, 39, Rue de l'Echiquier, Paris—Certain imp. in the construction of heating apparatus. (A com.)
 619. C. N. Kottula, Liverpool—An imp. in the manufacture of neutral hand or skin soap.
 620. A. Biddell and W. Balk, Ipswich—Imp. in steam boilers.
 621. J. F. Brinjes, jun., 25, Fildgate-street, Whitechapel, and H. J. Collins, West-hill, Wandsworth—Imp. in the manufacture and reburning of animal charcoal.
 623. J. V. Hielakker, Brussels—An improved machine for compressing coal, other fuel, and substances requiring pressure.

Dated 25th March, 1858.

625. W. S. Clark, Atlas Works, Upper Park-place, Dorset-square—Imp. in the construction of railways. (A com.)
 626. D. A. Hopkins, Paterson, U.S.—Imp. in journal boxes.
 627. W. Crook, Blackburn—Imp. in looms.
 628. J. Nuttall, Walmersley, near Bury—Imp. in looms.
 629. G. H. Ellis, New Malton, Yorkshire—Imp. in kitchen ranges.
 630. W. E. Newton, 66, Chancery-lane—Imp. in the means of and lamps for burning certain kinds of oil and hydro-carbons. (A com.)
 631. F. Haecq, 14, Place de la Reine, Brussels—Imp. in pumps for pumping beer, wine, vinegar, oils, or other liquids, containing acids or oily matters. (A com.)
 632. F. Foucou, 44, Rue Caumartin, Paris—Imp. in steam boiler and other furnaces.
 633. W. Richards, Birmingham—Imp. in breech-loading guns and fire-arms.
 635. W. Rojohn, Stanhope-street, Hampstead-road—Certain imp. in organs.
 636. F. A. Chevallier, Paris—Imp. in photographic apparatus.

Dated 26th March, 1858.

637. R. A. Brooman, 166, Fleet-street—Imp. in weighing machines. (A com.)
 639. P. H. G. Berard, 323, Rue St. Denis, Paris—Applying concentrated collodion to the effect of superseding caoutchouc in waterproofing stuffs of all descriptions for manufacturing garments and wearing articles, and also for applying it over painted surfaces instead of varnish.
 641. J. Horton, Smethwick—An imp. or imps. in the construction of the girders used in the guide framing of gas holders.
 643. H. Doulton, Lambeth—An imp. in the manufacture of invert blocks used in constructing sewers and drains.
 645. W. E. Newton, 66, Chancery-lane—An improved machine for performing the addition of numbers, quantities, or sums of money, to be termed the "arithmometer."
Dated 27th March, 1858.
 647. J. Newman and J. F. Newman, 121, Regent-street—Imp. in spectacles.
 649. E. C. Jones, Caroline-street, Bedford-square—Imp. in railway brakes.

651. B. Burrows, Leicester—Imp. in weaving webs or narrow goods, and in ornamenting elastic webs.
 653. J. Welch, Southall—Imp. in portable railways, and in the means of their application to carriages to facilitate their movements on common roads and other surfaces.
 655. W. A. Glibbe, 4, South-street, Finsbury—Imp. in treating mearcharies fluids. (A com.)

Dated 29th March, 1858.

657. W. A. Glibbe, 4, South-street, Finsbury—Imp. in treating brandies and other spirituous liquids for improving their quality. (A com.)
 659. J. R. Breckon, Darlington, and R. Dixon, Crook, Durham—Imp. in the construction of coke ovens.
 661. J. F. Spencer, 1, Adelaide-place, London-bridge—Imp. in marine engines.
 663. J. Ballis, 167, Carolinen Gasse, Vienna—An improved construction of coiled spring.
 665. I. Brown, Carlisle, and J. Brown, Notting-hill—Imp. in the manufacture or production of manure.
 667. E. A. Jacquin, Rue des Lavandieres, Ste. Opportune, Paris—An imp. in preparing plates for printing. (A com.)
 669. W. Harding, Forest hill, Kent—Imp. in revolver fire-arms, and in apparatus for manufacturing projectiles.

Dated 30th March, 1858.

671. J. C. Durand, Pimlico—Imp. in the manufacture of iron.
 673. T. Silver, Philadelphia, U.S.—Palating valves or governors.
 675. B. Wood, Huddersfield—Imp. in machinery or apparatus for cleansing the waste of woollen or other fibrous manufactures.
 677. W. E. Newton, 66, Chancery-lane—Imp. in the manufacture of sheet iron. (A com.)

Dated 31st March, 1858.

679. F. A. Gatty, Acorington—Imp. in treating certain compounds containing the colouring matter of madder.
 681. M. B. Westhead and H. Baines, Manchester—Certain improved apparatus for coupling or connecting carriages, wagons, trucks, vans, and engines used or employed upon railways.
 683. E. H. Todé, Peckham—Imp. in apparatus for generating steam in steam boilers by means of gas.
 685. B. W. Croker, Vienna—Imp. in axle boxes to render them self lubricating.
 687. F. Edwards, Hillfields, and W. Edwards, Howard-street, Coventry—Imp. in weaving.
 689. J. H. Johnson, 47, Lincoln's-in-fields—Imp. in articles of buoyancy, to be used either for swimming or for the saving of life from drowning. (A com.)
 691. R. Barr, Glasgow—Imp. in machinery or apparatus for making rivets, spikes, nails, and screw blanks, and similar articles in metal.

WEEKLY LIST OF PATENTS SEALED.

April 9th.

2589. J. Harland.
 2596. G. F. Lombard.
 2599. A. Barlow.
 2601. R. Porter.
 2606. F. Prestage.
 2607. G. Beard.
 2609. W. Calvert.
 2611. M. Henry.
 2677. D. Patridge.
 2685. I. Storey and J. H. Storey.
 2713. C. de Clippale.

April 13th.

2612. W. Brookes.
 2617. J. H. Simpson.
 2625. J. F. Swinburn.
 2629. J. Middleton and W. Ry-lance.
 2630. T. Restell.
 2631. J. Parker.
 2632. J. C. Plomley.
 2634. E. Wilkins.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 6th.

789. J. H. Johnson.
 801. S. Holt.
 805. J. L. Norton.
 784. W. Ricketts and T. Bulley.

April 10th.

502. G. F. Wilcox, C. A. Hanson, and J. J. Wallis.
 785. S. Fielding.
 819. T. Wimpenny and J. Wimpenny.
 823. G. Turner.
 835. E. H. Bentall.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4074	April 8.	Improved Curved Tooth-Brush	W. Herring	121, St. John-street, West Smithfield.
4076	" 9.	{ Photographic Portable Dark Operating Chamber	W. W. Bouch	180, Strand.
4076	" 9.	A Marine Course and Distance Indicator	H. Bridson	Bolton-le-Moors, Lancashire.
4077	" 12.	A Combined Needle Case	C. C. Fols.	Temple, London.
			A. Turley	New-street, Worcester.

Journal of the Society of Arts.

FRIDAY, APRIL 23, 1858.

THE LATE MR. R. HORSMAN SOLLY.

The Secretary has received a communication from the Executors of the late Mr. Solly, to the effect that he has bequeathed to the Society the sum of One Hundred Pounds.

CONVERSAZIONI.

The Council have arranged for two Conversazioni during the present session; the first on Saturday next, the 24th April, at the Society's House, the card for which will admit the member only; the second on Saturday, the 8th May, at the South Kensington Museum, the card for which will admit the member and two friends, ladies or gentlemen. The cards for each of these evenings have been issued.

Members of Institutions in Union who are anxious to attend either of these Conversazioni, are requested to apply to the Secretary of the Society of Arts, through the Secretary of the Institution to which they belong.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition was opened on Monday, the 5th instant.

The Exhibition will remain open every day until further notice, from 10 a.m. to 4 p.m., and is free to members and their friends. Members, by ticket, or written order bearing their signature, may admit any number of persons. The number of visitors up to yesterday, the 22nd inst., was 2,702.

LOCAL BOARDS—PREVIOUS EXAMINATION.

Fifty Local Boards have been formed. Returns of the Candidates who have passed the Previous Examination have been received up to the 22nd inst., as follows:—

Leath	4
Wigan	6
West Hartlepool	3
Leeds (Christian Institute), No. 1.	14
Northwram	1
Portsmouth	2
Warminster	1
Basbury	2
Macclesfield	83
Newcastle-on-Tyne	3
Lynton	1
West Brompton	4
Leeds, No. 2.	10
Wakefield	4
Pembroke Dock	4

Ipswich	6
London Mechanics' Institution	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	18
Halifax, No. 1.	15
Salisbury	1
Sheffield	18
Liverpool	35
Lockwood	1
Halifax (Working Men's College), No. 2.	21
York	7
Berkhamstead	19
Bristol	11
London Domestic Mission	1
Royal Polytechnic Institution	28
Birmingham, No. 1, Messrs. Chance's Reading Room	2
Sheerness	1

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date:—

T. D. Acland, Member of Council	£ 5 5
The Rt. Hon. C. B. Adderley, M.P.	5 0
John Ames	5 5
J. G. Appold, F.R.S., Auditor	10 10
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
H. D. Cunningham, R.N.	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation)	10 10
F. Seymour Haden (annual)	2 2
William Hawke	1 1
Edward Highton (annual)	2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Coun- cil (second donation)	10 10
George Moffatt, M.P.	10 10
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford	1 1
Charles Ratcliff, Hon. Local Sec. (annual) ...	10 10
Joseph Skey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council (third donation)	10 10

NINETEENTH ORDINARY MEETING.

WEDNESDAY, APRIL 21, 1858.

The Nineteenth Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 21st inst., W. R. Grove, Esq., Q.C., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Beale, Lionel S., M.D.	Salisbury, the Marquis of,
Davies, George	K.G.
Gifford, William J.	Todé, Edward Henri
Loxley, John	Webster, James Porter
Maguire, John Fras., M.P.	Winder, Thos. Robt., C.E.

The following Institution has been taken into Union since the last announcement :—

St. Bartholomew's Working Men's Literary Institute.

The Paper read was—

ON THE PROGRESS OF THE ELECTRIC TELEGRAPH.

By C. W. SIEMENS, C.E.

The growing importance of the electric telegraph, both in a scientific and social point of view, and the circumstance of my connection for a good many years with its practical development, are the apologies I have to make for venturing to occupy the attention of the Society this evening.

The object which I have more particularly in view is to trace the gradual course of progress of this invention since the time of its first appearance upon the stage, without pretending indeed to establish any new historical facts or to decide upon the relative merits of contending claimants to invention or discovery, (although I shall not willingly offend against the right of anyone), but with a view to establish more clearly our present position in the scale of progression, and to point out with some degree of certainty the direction in which we should travel in order to realise still greater results, particularly the accomplishment of transoceanic communication.

When, little more than a century ago, Franklin, the father of electrical science, ascertained that atmospheric electricity, which manifested itself in the imposing form of thunder and lightning, was identical with frictional electricity, he employed an apparatus comprising an insulated metallic conductor, the electric machine, the earth return circuit, and a receiving instrument, consisting of a pair of cork balls, suspended by silk threads, which, upon being electrified, struck against a pair of signal bells. This apparatus comprised, indeed, all the elements required for the construction of a modern electric telegraph. Nor was the idea of an electric telegraph new, even in the days of Franklin, for we are informed that as early as the year 1728, a pensioner of the Charter House, named Stephen Grey, made electrical signals through a suspended wire, 765 feet long. Yet a century of unceasing efforts, by men of all civilised nations, including some of the greatest natural philosophers the world ever produced, was still required to reduce those elements into available forms for practical purposes.

If we pass over the experiments by Winkler, of Leipzig, in 1746, Watson, of London, and Le Monier, of Paris, in the year following, as preliminary inquiries into the velocity of the electric current in metallic conductors, we find that the honour of having produced the first electric telegraph is due to Leage, of Geneva, who actually constructed, in 1774, an experimental line of communication, consisting of 24 suspended line wires, representing the 24 letters of the alphabet respectively. Each wire terminated in a pith ball electrometer, the balls of which separated, upon the wire in question being charged at the other extremity by means of a Leyden jar, denoting the letter intended to be communicated. Lomond, of France, perceiving the difficulty and expense attending so many line wires, contrived, in 1787 (see "Young's Travels in France," 1787), an experimental line of telegraph in his house, consisting of only one line wire connected with a pith ball electrometer

at both ends, and he proposed a telegraphic code by repetitions of his only primitive signals. Reimer, Dr. Salvo, of Madrid, and many others proposed various modifications of the same apparatus, but it is hardly necessary to add that all of them remained unrewarded by success.

In consequence of so many fruitless attempts, electric telegraphs were already being classed among the chimerical projects of the time when at the dawn of the present century a new field for invention was opened by the important discoveries of the Italian philosophers, Galvani and Volta.

The voltaic current, unlike the spontaneous discharge of static electricity, could be conducted with comparative facility through long metallic conductors, and was capable of very powerful effects in decomposing water or other substances, which qualities rendered it clearly preferable for telegraphic purposes.

Struck by these views, Soemmering, of Munich, constructed, in 1808, the first voltaic telegraph, consisting of 35 line wires, any two of which could be combined to form the electric circuit and produce a signal at the other extremity by decomposition of water under any two of 35 inverted glass cups, arranged side by side in an oblong bath of acidulated water. The 35 wires terminated in gold points, under the inverted glass cups (or voltmeters), and the rising of the gases of decomposition betrayed to the attentive observer the passage of the current.

The difficulty of dealing with so many wires suggested to the mind of Schweigger the same expedient which Lomond had recourse to with regard to static electricity, that of reducing the number of line wires to a single metallic circuit, and the receiving instrument to a single decomposing cell, having recourse to repetition, and to differences in the duration of succeeding currents, in arranging his telegraphic code.

It seems not improbable that if electrical science had made no further advances, the projects of Soemmering and Schweigger would have gradually expanded into practically working chemical electric telegraphs, such as have been proposed at a much later period by E. Davy, 1838, Morse, 1838, Bain, 1843, and Bakewell in 1848, which latter is particularly interesting inasmuch as not mere signals or conventional marks are received by it, but a fac-simile of the message, previously written with a solution of shellac upon a metallic surface.

The discovery of Oersted, in 1821, which, under the hands of Schweigger, Ampère, Arago, and Sturgeon, soon expanded into electro-magnetism, turned the tide of invention into quite another direction. Ampère was the first to propose an electro-magnetic needle telegraph, consisting of 24 needles, representing each a letter of the alphabet, and 25 line wires, the extra wire being intended for the metallic return circuit common to all. Ritchie executed, in 1832, a model of Ampère's telegraph, with an essential improvement, to the effect that each needle, by its motion, moved a screen disclosing a letter of the alphabet.

Another version of the same general arrangement was patented by Alexander, of Edinburgh, as late as 1837. Fechner, of Leipzig, and Schilling von Canstatt, of Russia, proposed, in 1832, apparently independently of each other, a single-needle telegraph, with deflection of the needle to the right and left; and Fechner was the first to prove, by calculation, the power of the galvanic current to traverse a great length of line wire.

Gauss and Weber, of Goettingen, took up the subject of electric telegraphs at about the same time, but had not proceeded far when their attention was diverted by the great crowning discovery in electrical science, I mean the discovery of induction and of magneto-electric currents by Faraday, in 1831.

Gauss and Weber rightly judged the superiority of magneto-electric over voltaic currents for telegraphic purposes, and in applying them they effectually established the first working electric telegraph in 1833, with the ar

rangements of which I became practically acquainted some years later, when a student at Goettingen.

It consisted of a line wire and return current wire, the former of which was carried upon high posts over the town of Goettingen, extending from the observatory to the tower of the public library, and thence to the new magnetic observatory of Weber, a distance of little more than an English mile. The magneto-electric current was produced by means of a coil containing 3,600 turns, which was situated upon a compound bar magnet, weighing 75 lbs., the coil being at liberty to slide freely to and fro upon the bar. In sliding the coil rapidly from the centre toward the south pole of the magnet and back again, a succession of two opposite currents was produced, which, traversing the line-wire circuit, including coils of the receiving instrument, caused a short jerk of the needle, say to the right and back again, whereas the deflection of the needle would be to the left when the exciting coil was moved towards the north pole and back. The amount of motion imparted to the coil determined also the amount of deflection of the needle, and could, by means of a telescope and a scale, be read off in degrees on a reflector attached to the end of the needle. The needle itself weighed 100 lbs., and was suspended from the ceiling of the room by untwisted silk. Notwithstanding the extraordinary weight of the needle, (which was the same as that used by Gauss to determine the laws of terrestrial magnetism) its motions were beautifully energetic and distinct when viewed through the telescope. Gauss and Weber did not pretend, however, to the construction of a commercially useful electric telegraph, but delegated that task to Steinheil, of Munich, who enjoyed already at that time a reputation as a skillful mechanic. Steinheil applied himself vigorously to the task, and produced, in 1837, his needle printing and acoustic instruments, which he first tried at Munich through about 5 miles of suspended line wire and shortly afterwards upon the Taunus Railway, near Frankfort. In trying whether the rails might not be used for metallic conductors, he re-discovered the conducting power of the earth itself, which, it appears, had been lost sight of since it had first been discovered by Franklin with regard to static electricity, and proved also with regard to Voltaic electricity, in 1803, by Erman, Basse, and Aldini.

The first recording instrument, and the telegraphic earth circuit, are discoveries which entitle Steinheil to a high position among the originators of the electric telegraph, although the means he proposed for its execution were too refined for the time, and did not lead on that account to immediate practical results.

At the time when Steinheil was absorbed in his labour, Professor Wheatstone was also engaged upon a series of experiments on the velocity of electricity, with a view to the construction of electric telegraphs, and in June, 1837, he joined Mr. Cooke in a patent for a needle telegraph of five line wires (besides one wire for the return current), and as many needles, which, by an ingenious system of permutations, could be so deflected that any letter of the alphabet was pointed out upon a diamond-shaped board by the convergence of two needles towards it. The line wires were proposed to be coated with insulating material, such as fibrous substances saturated with pitch, and to be drawn into leaden pipes, in order to exclude the moisture of the ground into which they were intended to be laid. An experimental line of telegraph on this principle was established in the same year, at the Euston Railway Station, and the results obtained left, it appears from documentary evidence, no doubt upon the mind of the then resident engineer of the London and Birmingham Company, the present Sir Charles Fox, of its ultimate success. That success, however was not obtained without a struggle against practical difficulties, in the course of which the system underwent important modifications, of which the double needle instrument, such as is still used extensively in this country, and (in 1845) a return to overground line wires, were the results.

To Cooke and Wheatstone is due the credit of having established the first commercially useful lines of electric telegraph, namely, the lines between Paddington and Drayton, commenced in 1838, and between London and Blackwall, commenced in December 1839, which were soon followed by others.

If viewed from our present position, the needle telegraph cannot be considered an advance, in point of principle, on Gauss and Weber, or Steinheil: it involved, in fact, a return from magneto-electric to Voltaic currents—from a single-line wire to several—and from recording of messages, to their mere indication; yet, for the time being, when insulation was imperfect, and the important law of Ohm was hardly understood, except by a few natural philosophers, it had the probability of success in its favour, because the duty required from the electric current consisted in deflecting a magnetic needle to a merely appreciable extent, and it was of no great importance to the result whether a more or less considerable proportion of the current was lost through imperfect insulation. The upright weighted needle—the key with dry metallic contacts—and other details, were also of a novel and meritorious character. Why the same system should however be still persisted in at the present day, in this country, when improved systems have been adopted in nearly all other countries, including the British possessions, is a question which, I hope, will receive an answer from those who practically uphold it. It is evident, however, that Wheatstone did not intend to stop there, from his numerous other inventions, which followed each other in rapid succession, and amongst which his dial and printing instruments—his early applications of magneto-electric currents—the relay—and the first judicious application of electro-magnets, so as to obtain more powerful effects at distant stations, are the most remarkable.

The country of Franklin has not been behindhand in gathering the first fruits of electrical science. It is said that Morse contemplated the construction of an electric telegraph since the year 1832, although he did not take any overt step till the year 1837, when he lodged a caveat in the American Patent Office, which patent was not enrolled till the year 1840. There is no evidence to show that Morse's early ideas had assumed any definite shape until the year 1838, when he deposited an instrument of his construction at the Paris Academy of Sciences. Morse's invention consists chiefly in the substitution of electro magnets for needles in the construction of a recording instrument, which, in other respects, is similar to Steinheil's. The step was, however, an important one to render the instrument powerful and certain in its action, and, combined with Wheatstone's relay, Morse's recording instrument will, it may be safely affirmed, be used universally for all except local telegraphic communication.

In the year 1845, when the practical utility of electric telegraphs had been demonstrated in England, several continental governments determined upon their establishment. The Belgian, Austrian, and, a few years later, the Sardinian government, simply adopted the double needle telegraph. In France, Messrs. De Foy and Breguet, fils, contrived a double step by step or dial telegraph on Wheatstone's principle, which enabled them to imitate the same code of signals which had been used for the Semaphore telegraph.

In Prussia a royal commission was appointed to consider and advise upon the system to be adopted, of which commission my brother, Werner Siemens, who had been engaged before with kindred subjects, became the most active member. The commission was in favour of an underground system, and charged Werner Siemens to institute experiments. About this time gutta serena had become known in this country, and having been struck with its peculiar plasticity, I forwarded my brother a sample, to see whether he could use it for the purposes he had in view. He soon discovered its remarkable insulating properties, and recommended an experi-

The following Candidates were balloted and duly elected members of the Society :—

Beale, Lionel S., M.D.	Salisbury, the Marquis
Davies, George	K.G.
Gifford, William J.	Todé, Edward Henri
Loxley, John	Webster, James Post
Maguire, John Fras., M.P.	Winder, Thos. Robt

The following Institution has been taken into the Union since the last announcement :—

St. Bartholomew's Working Men's Literary Institution.

The Paper read was—

ON THE PROGRESS OF THE ELECTRIC TELEGRAPH.

By C. W. SIEMENS, C.E.

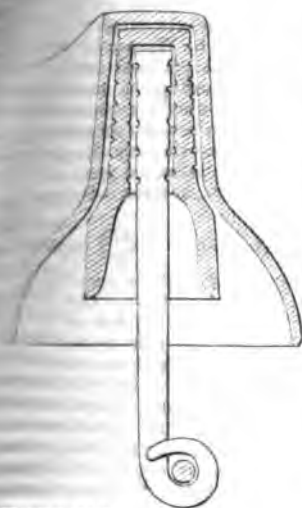
The growing importance of the electric telegraph in a scientific and social point of view, and the assistance of my connection for a good many years with practical development, are the apologies for venturing to occupy the attention of the Society this evening.

The object which I have more particularly in view is to trace the gradual course of progress since the time of its first appearance, without pretending indeed to establish historical facts or to decide upon the merits of the contending claimants to invention or priority. I shall not willingly offend against the latter, but with a view to establish more fully the position in the scale of progress which it now occupies with some degree of certainty that we should travel in order to realize more particularly the accomplishment of the telegraphic communication.

When, little more than a century ago, the father of electrical science, Alessandro Volta, discovered electricity, which manifested itself in the form of thunder and lightning, was the first to employ electricity, he employed an insulated metallic conductor, connected with the earth return circuit, and a series of a pair of cork balls, which, upon being electrified, would attract and repel bells. This apparatus composed the first telegraph required for the construction of the electric telegraph. Nor was the idea even in the days of Franklin, as early as the year 1752, in the House, named Stephen Gray, through a suspended wire of unceasing efforts, including some of the most brilliant of the world ever produced elements into available.

If we pass over the experiments of Leipzig, in 1746, and of Paris, in the year 1752, into the velocity of the electric ductors, we find the first electric telegraph actually constructed in 1787 (see the perimer only on

either rain or dew. Every
best insulator, at which the



INSULATOR.

supported but held firmly by means
ment which has been found very con-
nection of the line-wire, and in case of
the importance of a good insulator
the fact, that the cost of finding and
fect of the line-wire, in a country
s on the average to £80.

h the subject of submerged conduc-
present time, engrosses the attention
neers, and also commands a large share
owing both to the difficulties with
unded, and the vast importance of the

history of submarine cables, it appears
periments, on a small scale, to submerge
nductor (copper wire coated with cotton
n with pitch and tar) were made at Cal-
by Dr. (now Sir) William O'Shaughnessy.
neatstone proposed, in the following year,
tegraph cable between England and France,
very elaborate and well-considered plans,
kindness, I am enabled to place before the
ne cable Wheatstone proposed contained 6
ulated copper wires which were protected
sheathing of iron, differing, however, from
ng now generally adopted, in being devoid of
a longitudinal direction.

telegraphs must, however, have proved im-
port for the timely discovery of gutta percha,
remarkable insulating properties. It is, there-
prising that the first successful attempts to
sub-aqueous conductors were made by Werner
in 1848, in the bay of Kiel, and in crossing
at Cologne, and other rivers.

gutta percha coated copper wire was at first sub-
without outer protection, but it was laid by the
strong chain to protect it from anchors. In
following year, however, a lead coating was intro-

percha coated copper wire, without external protection,
and failed immediately after it had been laid. In the
following year, Crampton laid a cable between the same
places successfully. This cable was sheathed with iron
wire, according to Messrs. Newall and Co's. patent process,
which gives great longitudinal strength, and has been
generally adopted ever since, except in the instance of
the Varna-Balacava cable (laid by Messrs. Newall and
Co. in 1854), which had no sheathing, excepting at the
shore ends, and which worked successfully till just
before the evacuation of the Crimea by the allies.

It would be tedious to notice the numerous successful
and unsuccessful attempts which have been made since
the year 1837, to establish submarine cables, suffice it to
state the general results of the experience obtained,
which goes to prove that the difficulty of submerging and
working submarine cables is small in shallow and narrow
waters, but increases in a very rapid ratio with the
depth and breadth of the ocean to be traversed.

An inquiry into this most interesting subject may be
divided into three sufficiently distinct heads, namely,
the mechanical problem of constructing and submerging
the cable; the electric condition of the submerged cable;
and, lastly, the question of suitable instruments.

The mechanical problem has been discussed lately at
great length at the Institution of Civil Engineers, I
therefore propose to limit myself to a recital of the
principal points of interest which may be considered as
established both by theory and in practice.

The cable should be of small specific weight and of
great tensile strength, in order that its descent through
the water may be retarded by the resisting medium to
such a degree that the velocity of maximum acceleration
may not exceed one-fourth, or at most one-third, of the
velocity of the vessel. This condition of a "balanced
cable" being fulfilled, there remains the tendency of the
cable to slide down the inclined trough of the water, and
it has been proved that this force equals, under all cir-
cumstances, the weight of a length of cable (less the
weight of water it displaces) reaching from the vessel per-
pendicularly to the bottom of the sea. The same amount
of retarding force must at least be applied to the paying-
out brake, to prevent great waste of cable, and the cable
itself must of course be sufficiently strong to bear this
strain without injury to the insulated wire or wires.

Messrs. Longridge and Brooks have been the first to
prove, I believe, that currents in the ocean cannot
sensibly augment the strain upon a descending cable, nor
are they likely to occasion considerable loss.

It has been proposed to increase the floating power of
deep-sea cables, by attaching floats at intervals; but it
appears to me that such appliances, which depend upon
the unerring dexterity of workmen at the moment of
danger, and which moreover do not relieve the cable
from retarding strain at the brake, should be discarded,
and the cable be made to possess in itself all the re-
quisite degree of buoyancy and strength. For this pur-
pose, the conducting wire or wires should be as light as
possible consistent with good conducting power, a combi-
nation of properties which seems to point to the newly
discovered metal, aluminium, as likely ultimately to
supersede copper. The insulated covering of gutta per-
cha increases the bulk without adding to the weight
of the cable, being nearly of the same specific gravity as
sea water, it improves both the mechanical and elec-
trical properties of the cable, and the only limit to its
desirable thickness is its expense. The principal weight,
and all the available strength of the cable, reside in its
sheathing, which should be made of a material combi-
ning strength with lightness, and also with hardness, to
resist the the crushing and tearing action of the brake-
wheel: and there can be no doubt that steel wire combines
these qualities in the highest degree, nor do I think it
would be much dearer than iron if power of suspension
was taken for the basis of calculation.

It can easily be shown, by the simple rule given

first attempt to establish a sub-aqueous conductor
the open sea (from Dover to Calais) was made
Wheatstone, in 1850. It consisted of a gutta

regarding the strain upon the cable in leaving the vessel, that an iron-sheathed cable cannot, under the most favourable circumstances, be laid in water of more than three miles in depth, without a certainty of rupture taking place, whereas a steel-covered cable might be laid, with reasonable safety, to a depth of five or six miles, which depth is, I believe, rarely exceeded in any ocean.

Respecting the paying-out machinery, I have to notice Messrs. Newall and Co.'s apparatus, consisting of a solid centre, and heavy rings to form a double cone for guiding the cable safely out of the hold, and the brake, which latter should be made as light as possible, to avoid jerks upon the cable, and should indicate the variable strain put upon it, to harmonise its speed with that of the vessel.

In order to insure continuity of the electric conductor in a cable, a strand of several copper wires is now generally adopted, instead of a single wire, which latter is found to be very liable to break. This simple but useful plan was, I believe, first thought of and acted upon by myself, having ordered some gutta percha coated strand, for experiment, from the Gutta Percha Company, in the spring of 1855, part of which I have laid upon the table.

The electrical condition of the submerged conductor is a subject of the greatest interest, upon which electricians are still divided, and which, treated mathematically, involves problems of the highest order, such as only Professor William Thomson and a few others can hope to deal with effectually. The important point is, however, to arrive, first of all, at a clear understanding of the laws of nature upon which those calculations should be based, and those laws, when rightly interpreted, are always extremely simple.

The submerged (or underground) line wire may in the first place be considered in the light of a mere conductor, following Ohm's law, which, as is well known, is to the effect that the amount of electricity passing in a given time depends upon the sectional area of the conductor, upon the electric force (intensity) of the battery, upon the specific conducting power of the material, and inversely upon the length of the conductor. It is expressed by the following formula:—

$$1. \quad P = \frac{Eac}{l} \quad \text{in which}$$

P, signifies the quantity of electricity passing;
E, the electric force of the battery, or its substitute;
a, the sectional area of the conductor;
c, the specific conducting power; and,
l, the length of the conductor.

In the next place, the cable has to be considered in the light of a Leyden jar of extraordinary length, formed of gutta percha, with the conductor for an inner, and the sheathing (or moisture) for an outer metallic coating. This Leyden arrangement has to be charged to a certain degree before the electric current can make itself felt at the further extremity, but the supply of electricity being limited at every point by the resistance offered by the conductor, according to Ohm's law, it follows that the entire cable can be charged only in a progressive manner, as though it consisted of a series of Leyden jars charging the one into the other until it reaches the last, which discharges itself through the receiving instrument into the earth. The amount of impediment thus offered to the progress of the electric current depends evidently upon the capacity of the Leyden arrangement, which capacity should be reduced to a minimum for a given size of conductor.

According to Faraday's definition of dielectrics, the electric charge obeys the same simple law, which regulates the dispersion of heat in an imperfect conductor, and which, again, is analogous to Ohm's law regarding electric currents. It follows that the electric charge of a Leyden arrangement is directly proportionate to the lining surfaces—directly to the electric force of the battery (or its substitute) employed, and to the specific inductive capacity of the insulating medium, but in-

versely proportionate to the thickness of insulating coating; or, if expressed by a formula, we have:—

$$2. \quad Q = \frac{ESk}{d} \quad \text{in which}$$

Q, expresses the electric charge;
E, the electric force of the battery;
S, the metallic surface;
k, the specific inductive capacity; and,
d, the thickness of coating.

This formula is corroborated by a series of very careful experiments by Werner Siemens upon electric cables, and it is of great practical utility if combined with Ohm's formula regarding the conductor.

The following are some of the simple consequences derived from the two formulae:—

1. The electric force (E) of the battery (and its substitute) has no influence upon the onward velocity of the electric wave, because it increases the value of P and Q equally.

2. The time ($t = \frac{Q}{P}$) required to charge a submerged conductor of a given proportion increases in the square ratio of the length (l) of the conductor—(in the formula for Q, the factor (S) has to be expressed by l and a)—which law was first arrived at by William Thomson in another way, and was communicated by him to the British Association in 1855, but has since been assailed by Whitehouse and other electricians.

3. It is of the first importance to make the conductor of the best conducting material, and the insulating coating of the greatest practical thickness, but of a material with the least specific conductive capacity.

4. Given the materials and the thickness of the insulating coating, the rapidity of progress of the electric wave increases in the simple ratio of the diameter of the conductor; a proposition differing also from the views of the promoters of the Atlantic cable, who assert that the maximum result is obtained by a conductor of comparatively small diameter.

The results obtained by means of these formulae are, however, modified by disturbing causes, which have to be taken into account by the electrical engineer. Among these, the conducting power of the gutta percha itself is the most important. It appears, from certain experiments made at Birkenhead by Messrs. Newall and Co., upon one-half of the Atlantic cable, that when the entire cable is formed into an electric circuit, only about one-third part of the current will follow the wire throughout its length, and the remaining two-thirds will pass through the gutta-percha covering to the earth. The relative amount of leakage through the covering increases in an extraordinarily rapid ratio with an increase of temperature; and it must be deemed a most fortunate circumstance that the temperature of the great oceans is probably not above 40 Fahr. at the bottom, being the temperature of maximum density of water. Messrs. Buff and Beete have found that glass also becomes conductive of electricity when but moderately heated; and they attribute the effect to electrolysis, or decomposition of the alkali it contains. In the case of gutta percha, it arises possibly from decomposition of the water of hydration or of some vegetable constituent of that substance. A careful experimental inquiry into this question, including some other deteriorating effects upon gutta percha, would be of great practical importance; and it is to be hoped that the Gutta Percha Committee, lately appointed by this Society, will furnish some valuable information.

The effect of leakage through the coating is retardation, in the direct proportion of the surface of the conductor, and the inverse ratio of the thickness of the coating; but the co-efficient varies according to the temperature and quality of the material. There are some other disturbing causes, of comparatively less importance, namely, voltaic induction and magnetisation

of the iron sheathing by the line-wire current. The voltaic induction, or tendency of one current to produce a current in the opposite direction in another conductor parallel to itself, is of importance only in the case of compound cables, and may even be turned to advantage, if the return current is laid through one of the parallel wires instead of the earth. By the same expedient, magnetisation of the sheathing, which is necessarily a retarding cause, and is, moreover, productive of a disturbing extra-current, may be neutralised.

In calculating the time required for an electric current to traverse a cable of given length and proportion, it may be received as an experimental datum to start from, that it reached the distance of 1,000 miles in one second, in a cable consisting of No. 16 copper wire coated with gutta percha to the thickness of $\frac{1}{8}$ ths of its diameter, a proportion most generally adopted. The discharge of the same cable would occupy practically about two seconds, and these times go on increasing in the ratio of the square of the length of conductor, in as far as the retardation by electric charge is concerned, and in the simple proportion of losses by leakage, voltaic induction, and magnetisation, the result being a mean between the two ratios.

With these facts before us, it would have been impossible to work an electric telegraph across the Atlantic or Indian oceans with anything approaching a commercial result; and the idea must have been abandoned, but for Faraday's timely discovery that several electric waves may co-exist, following each other, in a long cable, whereby the number of impulses to be transmitted in a given time may be greatly increased.

A difficulty experienced in carrying this method of working into effect, is the partial merging of the separate waves into an almost uniform electric charge of the conductor, which causes the receiving instrument to be permanently affected. This difficulty has however been removed by a return to Gauss and Weber's method of working, in sending always two opposite currents in succession, whereby not only the effective value of each wave is doubled, but accumulation of electric charge is entirely prevented, because the two opposite waves, in emerging, destroy each other. This method of working would, however, not be complete without a return also to the same description of current which Gauss and Weber employed. It has, indeed, been shown above, that currents of high electric force do not travel any faster through submerged conductors than feeble currents, but the advantages of the former are, that each electric wave represents a larger accumulation of force, and travels consequently to a greater distance before it has so far dispersed as to be no longer capable of producing an effect upon the receiving instrument, and moreover, that the positive and negative impulses are equal in amount.

The success of a long submarine line of electric telegraph depends also in a great measure upon the particular construction of both the communicating and receiving instruments. On this point I am in a position to speak from extensive experience, being connected with an establishment which had to contend at an early period with the difficulties experienced upon long underground lines, which has since carried out extensive systems of telegraphs in Russia and other countries, and has furnished the instruments of most of the continental lines, including those in Turkey, India, and Australia. In addition to this there is the experience of the Black Sea and the Mediterranean lines, which are the longest submarine lines hitherto constructed, with the instrumentation of which I was charged by Messrs. Newall and Co., the successful contractors of those undertakings.

Morse's recording instrument combined, as stated before, many practical advantages which recommend it for universal adoption for all mercantile lines, among which advantages is the facility it offers of forwarding messages at intermediate stations without the intervention of a clerk, in putting on a fresh battery, a system first in-

troduced by Siemens and Halske, and perfected by Steinheil, by which it is made possible to speak directly between London and the remote parts of Russia.

The real telegraphic receiving instrument is the relay, which has for its duty to establish and break the local circuit of the recording instrument.

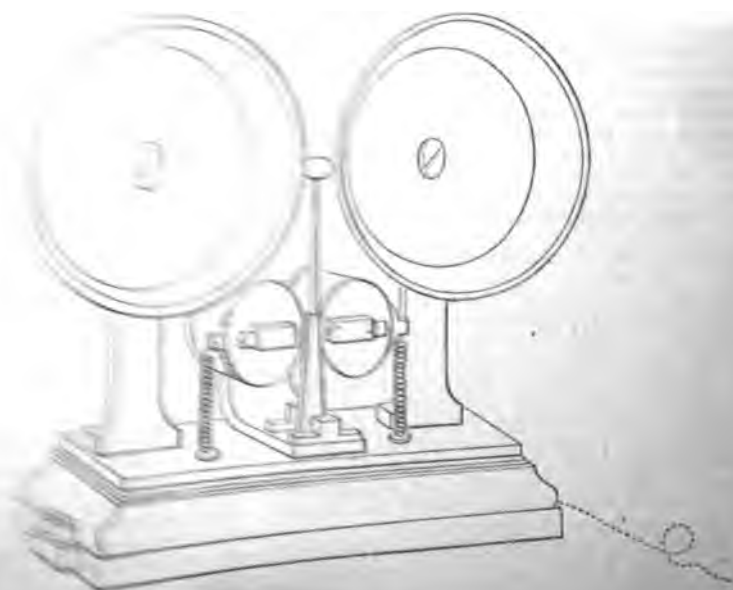
An important point in the construction of a delicate relay was the suppression of the armature of the electro-magnet employed (patented by Werner Siemens in 1851), by allowing one of the two upright bars of soft iron composing the horse-shoe electro-magnet to vibrate upon delicate points, and producing rotary motion by the attraction between approximated horizontal arms extending from the same. The application of magneto-electric currents necessitated a corresponding change in this relay; for, however sensitive it might be made, it was necessary that the effect of the line-wire current should be continued till the recording instrument has had time to make a dot or line upon the paper, and the magneto-electric current, being nearly instantaneous, is unsuited for that purpose. This difficulty has been removed by the introduction of permanent magnets, which continue the effect produced by the instantaneous action of the line-wire current, until the opposite effect is produced by the succeeding negative current. The vibrating tongue of the instrument (Figs. 2 and 3), is for this purpose balanced midway between the similar poles of a comparatively powerful permanent magnet, being equally attracted by both, but remaining in the proximity of either of them, into the attractive sphere of which it happens to be brought by the instantaneous action of the line-wire current, changing for an instant of time the name of one of the contending poles. A relay on this principle was first exhibited at the Great Exhibition of 1851 by Siemens and Halske.

The relative dimensions of the inductive coils, and of the coils in the relay, (depending upon the length and other conditions of the cable itself), are points which require very careful attention. The common practical rule, that the resistance of the coils must be increased with the increased length of conductor, is here entirely at fault, for the electric wave, when once formed, is no longer under the influence of its source, but may be compared to the dying wave of the ocean running up a shallow beach, which would have no power to force its way through a long and narrow tube, but is yet capable of delivering a large quantity of water into an open duct. For an analogous reason the coils of the relay must be composed of comparatively short and thick wire. The same rule applies to the inductive coils, which must be composed of thick wire in order to produce a quantitative wave. The Cagliari, Malta, and Corfu line is worked by instruments upon this principle, and the results obtained are very satisfactory—the messages being worked through the entire distance of 700 nautical miles (without making Malta a relay station) with ease, and at a sufficient rate.

This result proves that telegraphic cables not exceeding a thousand miles in length may be worked satisfactorily, and that, consequently, all reasonable doubts about the successful operation of a line from London to Calcutta may be considered as being removed, a result which I sincerely hope to see soon established in fact.

For distances exceeding a thousand miles, the difficulty of sending messages at an efficient rate for commercial purposes remains yet to be solved, for theory and experience combine to prove that the highest rate likely to be attained in working through a distance equal to the intended Atlantic cable, in taking full advantage of the power of waves, will not exceed three, or it may be four, words per minute, unless indeed some new principle of working is yet discovered, whereby a greater result is realised.

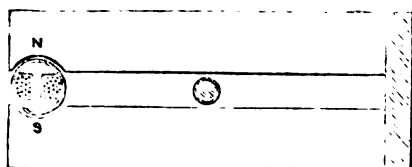
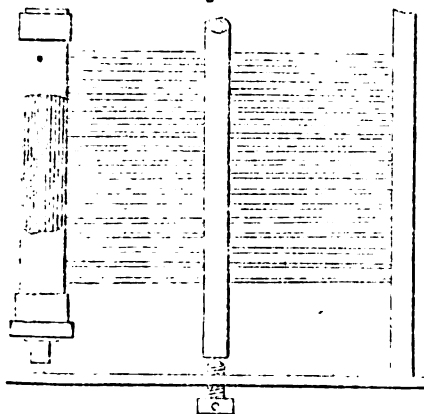
There would be one way, indeed, in which the capabilities, not only of long submarine cables, but of electric telegraphs generally, might be greatly increased.



THE ALABUM.

which consists in combining a number of insulated line-wires into one cable, and working them in metallic couples. This, indeed, is giving up the earth circuit, but, in its stead, we gain the power of working several sets of instruments without disturbing interference between the wires by Voltaic induction. Instead of using one of the wires (say the central wire) for the common return circuit, the metallic pairs might be selected by the rule of permutations, which, if carried out, would enable us to connect 6 pairs of instruments by means of 4 wires, 10 pairs by means of 5 wires, and so on. If a cable of 10 wires was laid between two great commercial centres, say between London and Liverpool, as many as 42 pairs of instruments might be used, which might be placed in the counting houses of great merchants and of their respective agents for their private correspondence, and this step would probably give rise to the more general application of the electric telegraph for private and domestic communication. The instrument that appears to be best suited for such purposes (including railway and town services) is a magneto-electric step by step or dial instrument (Fig. 4), a specimen of which I have placed

Fig. 4.



COMMUNICATOR OF DIAL INSTRUMENT.

before the meeting. This instrument combines the advantages of requiring no battery, with great facility of working, and it contains some novel arrangements, whereby its action is rendered powerful and certain, and which will be best understood from the drawing.

Of these instruments, 180 were adopted last year by the Bavarian Government, in lieu of instruments of a similar class that had been used there previously, and it appears, from an official document, that they give great satisfaction. A pair of them is also in use at the War-office and the Horse Guards; and another pair was taken out by Messrs. Newall and Co., to keep up telegraphic communication between the tender and tug employed in laying the last Mediterranean cables.

My summary of telegraphic novelties would not be complete without a notice of a method of sending messages simultaneously in both directions through one and the same line-wire, the joint invention of the Hanoverian telegraph engineer Frischen and my brother. It consists in splitting the current of the battery into two equal parts,

of which the one proceeds through the line and the other through an adjustable resistance coil by a short circuit to the earth. Both currents pass in opposite directions round the relay magnet of the communicating station, and neutralise each other in effect, but the portion of current passing along the line-wire, produces an effect upon the relay at the receiving station, and *vice versa*, but if both stations include their batteries at the same time, the current of the line-wire will be doubled, and in exercising a preponderating effect upon both relay magnets, will cause both to attract their respective armatures, and establish the printing circuits. By this means, the transmitting power of a single line-wire is doubled. This system works satisfactorily between Amsterdam and Rotterdam, and some other places where there is not much interference by intermediate service, but it is, I consider, as yet too refined for general application. The same objection applies to a system of accelerating the speed of transmission of messages by preparing strips of perforated paper which, in passing between a metallic roller and contact finger, break and restore the metallic current with unlimited rapidity; a system first introduced by Bain, years ago. These plans will very probably be of great practical utility eventually, when the use of the electric telegraph is more extended.

In conclusion, I have to thank the meeting for their patience in listening to this paper, which far exceeds the limits I had assigned to it. I have to express my special thanks to Professor Wheatstone, Mr. Latimer Clark, Dr. Green, Mr. Edward Bright, and Messrs. Newall and Co., for their liberal aid, in furnishing me with models to illustrate the subject.

I wish to draw particular attention to the key and relay arrangements of Mr. C. Varley, which are used upon the Dutch cable, and the acoustic telegraph, worked by secondary circuit, which is used by the British Magnetic Telegraph Company, and which lack of space has prevented me from describing in the paper. The paper is, I am aware, deficient in many respects; but I shall be satisfied if I have succeeded in showing, by what has been done, what greater results may yet with certainty be accomplished, and if, by inviting discussion, I have contributed to hasten the period when the electric telegraph will no longer be the wonder of the age, but will become the simple and ever-ready agent to extend the range of human intelligence and power upon the earth, fettered no longer by the limits imposed by distance.

In conclusion, Mr. Siemens explained the numerous instruments and diagrams before the meeting, amongst which were the early needle telegraphs, by Cooke and Wheatstone; Professor Wheatstone's dial instrument and early magneto-electric arrangements; Bain's chemical telegraph, and Henley's double needle telegraph; the instruments in actual use by the Electric and British Telegraph Companies; the arrangement of instruments used in working the Dutch cables, consisting, on the English side, of Mr. Varley's arrangements, and on the Dutch side of Siemens and Halske's recording instruments; the recording instruments worked by induced currents (produced by a Ruhmkorff coil) used on the Mediterranean cables; Siemens and Halske's new step by step or dial instruments, and the recording instruments by the same firm, which were used upon the East Indian lines and elsewhere; besides a variety of rotary apparatus, alarms, &c.

DISCUSSION.

The CHAIRMAN, in inviting discussion, said that perhaps it would be as well that speakers should apply themselves more to general topics, than to the mechanical details of the instruments before them. In looking at the array of apparatus on the table, it was wonderful to think that the whole of these inventions had resulted from the scientific researches of the last half century, which showed how rapid had been the pro-

gress of electric science. He thought that important points for discussion were, the best means of insulation and the best form of battery power. It would be interesting to hear observations upon these two subjects. At present it did not appear that for long lines of telegraphic communication a better insulator than gutta percha could be found, which combined a great degree of insulation with plasticity, toughness, and strength to resist the ordinary accidents to which telegraphs were subjected. It had been remarked by Prof. Faraday that various specimens of gutta percha differed in conducting power, as also in durability. Doubtless very considerable steps in the improvement of the electric telegraph would be effected if they could with certainty produce gutta percha of a quality giving it a greater power of insulation. Another important point was—what was the best form of power to be used for the transmission of the electric current. That must necessarily differ according to the uses to which the instruments were put. A different power was required for short distances to that which would be suitable for long distances, such as the Atlantic telegraph. One advantage of magneto-electric power, as opposed to that of the battery, was that the apparatus was always ready, and only required small mechanical power to work it. It had been found to answer well for short distances, and, with regard to its applicability to long lines, no doubt some opinions would be given that evening. There had of late been many improvements in the means of inducing electricity of high power; for instance, the Rhumkorf coil, by means of which a great increase in the power of the current had been produced; and thus immense intensity was obtained with a comparatively small battery. It was stated that in order to obtain sufficient intensity to work a length of telegraph such as the Atlantic cable, they would require 500 Daniell's cells, whilst with the Rhumkorf coil it was probable they would be able to obtain sufficient intensity with a much smaller number. Another important point was the occasional rupture of the copper wire in submarine cables. It was argued that by having the outer iron sheathing of a twisted or spiral form, whilst the wires of the inner core were straight, there was a greater power of stretching in the outer than in the inner wires, and he did not know how far the breakages that had taken place were due to that circumstance. He thought, however, it was very desirable to have the whole cable so constructed, that the stretching of the wires, if any, should be uniform, and that one part of the cable should not stretch in a greater degree than the other.

Mr. W. SMITH thought Mr. Siemens was slightly in error upon one or two of the facts he had brought forward. He had stated that the first attempt to establish a subaqueous conductor across the open sea, was made by Wollastone (from Dover to Calais), in 1850; and that in the following year Crompton laid a cable between the same places successfully. This cable, it was added, was sheathed with iron wire, according to Messrs. Newall and Co's patent process. He (Mr. Smith) thought there was some mistake here, inasmuch as he was not aware that Messrs. Newall and Co. had any patent for that form of cable. The fact was that in 1847 the first specimens of that form of cable were made for Mr. Brett, who, he believed, patented a system of interoceanic telegraph in the year 1845. Mr. Brett's plan was to coat copper-wire with india-rubber—the best insulator then known—and to enclose the wires in a series of iron tubes, united by ball-and-socket joints. He (Mr. Smith) had no wish to advance any claim to invention in connection with submarine telegraph cables, but he would state that he believed he was the first to communicate to Mr. Brett, in 1847, the idea of protecting the insulated copper-wires forming the core, by a sheathing of iron-wire. Mr. Brett adopted the idea, and in the same year some specimens of that form of cable were made for him. That was long prior to the construction of the Dover and Calais cable. The cable to which Mr. Siemens alluded, was manufactured at Wap-

ping, and was only completed, but not commenced, by Messrs. Newall and Co. It was in consequence of some little difference with the contractor, that Messrs. Newall and Co. undertook to complete the cable, which was done with the very machinery which was originally designed for the manufacture of that form of cable.

Mr. LATIMER CLARK, in reference to the acknowledgment of the labours of Oersted and Ampère in the advancement of electrical science, had been lately struck by a passage in a French work on electricity, published in 1805,* from which it almost appeared that the influence of an electric current on a magnetic needle, and its effect in magnetising an iron bar, had been noticed and published long prior to the date of Oersted's discovery. Mr. Siemens had erroneously attributed to Professor Faraday the discovery of the possibility of the co-existence of several waves of electricity in one submerged wire. The phenomenon of the slow transmission of currents through submerged wires, was first noticed by him (Mr. Clark), in April, 1852, in the course of a series of experiments undertaken at the works of the Gutta Percha Company, to ascertain how far it would be practicable to work through gutta percha wires laid underground between London and Liverpool; and, in 1853, a patent was taken out to obviate the effect by surrounding the gutta percha wire with a coating of asphalt, or some cheap dielectric substance. The Electric Telegraph Company having completed eight underground wires from London to Liverpool, and meeting with much annoyance from the induction, Professor Faraday and Professor Airy were requested to attend at Lothbury, and, early in 1854, he (Mr. Clark) exhibited the phenomena of induction, and produced diagrams with three needles on chemically prepared paper, showing, in a very perfect manner, the passage and retardation of the current. These diagrams were afterwards exhibited by Professor Faraday at the Royal Institution, and formed the subject of a lecture there. He (Mr. Clark) had not met with much practical inconvenience from the breakage of the internal copper wire in submerged wires and single submarine cables, and cases of fracture were very unfrequent. In deep submarine cables, where every precaution was requisite, the difficulty had been successfully surmounted by the use of the twisted strand of wires, but as this necessarily occasioned some additional resistance, he did not consider its universal adoption desirable. With reference to the general use of the double-needle instrument in England, he thought this was not the result of any prejudice, but a consequence of the intrinsic merits of the instrument itself, which were such, that when persons had once become familiar with its use, nothing but compulsion would induce them to resort to any other. The Electric Telegraph Company were fully alive to the advantages of the Morse instrument, and had employed it extensively on all their principal commercial circuits for many years, and it was in daily operation on thousands of miles of telegraph in

* *Manuel du Galvanisme*, par Joseph Isarn, Paris, 1804. The passage is as follows, p. 126:—"Appareil pour reconnaître l'action du Galvanisme sur la polarité d'une aiguille aimantée."
"Préparation. Disposez les tiges horizontales, a, b, d, de l'appareil, Fig. 53. (a common universal discharger), de manière que les deux boutons se trouvent à une distance un peu moindre que la longueur des aiguilles que vous voudrez soumettre à l'expérience; et, à la place des boutons b, b, qui sont vissés sur leur tige respective, adaptez aux tiges, ou une petite pince, ou bien un petit ajutage applati. Usage. Après avoir placé l'aiguille, de manière que ses deux extrémités soient prises dans les deux petites pinces, établissez une communication de a, avec une des extrémités d'un Électromoteur, et de a, avec l'extrémité opposée. Effets. D'après les observations de Romagnesi, physicien de Trente, l'aiguille déjà aimantée, et que l'on soumet ainsi au courant galvanique, éprouve une déviation; et, d'après celles de J. Mejan, savant chimiste de Gènes, les aiguilles non aimantées acquièrent, par ce moyen une sorte de polarité magnétique."

this country. The needle instrument had, however, such advantages over the Morse in simplicity, in rapidity of transmission, and in facility of use, that they had in vain endeavoured to bring the Morse instrument into extensive use on railways. Nothing but the constant use of the two instruments side by side could enable a person to form a correct estimate of their relative value; and he could assure those who were in the habit of condemning the double-needle instrument on purely theoretical considerations, that they were, from imperfect information, falling into a very great error.

Mr. E. HIGNON said he objected to the statement in the paper—that the change from magneto-electricity to electricity developed directly by a voltaic battery, was a step in a retrograde direction. Every form of magneto-electric machines hitherto used in Great Britain and Ireland had failed; he instanced the instruments of Professor Wheatstone and Mr. Henley—instruments which, he believed, showed inventive talent of the highest order, but they were not commercially comparable with other plans when voltaic-electricity was employed. The first system of underground wires, as recommended by Mr. Werner Siemens, in Prussia, had proved a total failure, and nearly the whole of the capital invested therein by the Government had been lost.—He preferred the use of electricity produced by a battery and an electro-magnet, to that produced by a permanent magnet, inasmuch as the one could be increased to any extent, according to the weather, while the other could not. He objected to the statement in Mr. Siemens's paper as to Messrs. Newall and Co. being the patentees of the submarine telegraph as now used. The fact was, there was no practical method of making submarine cables published, prior to his own patent of September 21, 1850. He corroborated the statement of the author as to the immense risks that must be incurred in laying submarine cables in great depths of the ocean. He thought that the attention of those connected with the working long lengths of telegraph should now be directed to a system of codes. He instanced one of his own which contained 800,000,000 times 2,000,000 pre-concerted messages, all of which did not occupy one side of half a sheet of foolscap, and each would not occupy more than twelve seconds in transmission. Although Mr. Siemens had stated that by his instrument he could communicate between London and Odessa, there was no proof that this had been done. With respect to insulation, Mr. Highton remarked that this depended very much on the climate of the country to be passed through. He considered that for England and the west of Ireland, a different kind of insulation was required from that suitable to Italy or India, and such like countries. The telegraphic instruments, batteries, and other apparatus to be employed, ought to be suited to the work to be done, and he believed there was no one telegraphic instrument suitable to all cases throughout the world, but that each particular case required its own special apparatus. With regard to the purification of gutta percha, which had been alluded to by the chairman, he was happy to say that the Society had appointed a committee to investigate the whole subject, and he hoped that great results would accrue from their investigations. With regard to the breaking of the internal copper wire in submarine cables, he remarked that in the specification which he made for the British Telegraph Company's cable between Scotland and Ireland, he put in a clause which compelled the contractor for the making of the cable to give double the lay or twist in the copper wires to that of the outside iron wires, and thus prevent all strain from coming upon the copper wires until the iron wires had broken. The submarine cable of the British Telegraph Company had been most successful. Although weighing 180 tons, and containing six wires, of 25 miles in length, it had now been at work for nearly four years, and every wire up to the present moment was perfect, and since its submergence it had not cost the company anything for repairs. With regard to

the double-needle system of the original Electric Telegraph Company, he stated his belief that, sooner or later, if they were to compete with their rivals, they must use a one-wire system. Mr. Highton then read an extract from a work published by Mr. Ronalds, in 1823, which showed that the first telegraphic message ever transmitted in Europe was transmitted by an Englishman, in the year 1816, and that Mr. Ronalds then recommended the use of underground wires. Mr. Highton then exhibited and explained the instruments invented by himself, and used by the company with which he was connected, and which, through one wire, transmitted the last parliamentary speech of the Queen from London to Liverpool at the rate of 32 words a minute; and, through the same kind of instrument, with three wires, the speech of the American president, containing upwards of 16,000 words, was telegraphed from Liverpool to London at the rate of upwards of 3,500 words an hour, without a single mistake. He was sure that every one present would join in a vote of thanks to Mr. Siemens for his interesting paper.

Mr. PEARSELL regarded the historical record of the electric telegraph, presented to them that evening, as of great value, especially that portion which referred to the experiments of Steinheil. Some years ago, in passing through Bavaria, he (Mr. Pearsall) was charged to ascertain the practical results of Professor Steinheil's researches and experiments, when the Professor stated that he had carried on electro-telegraphic communication without any wire at all, by which he now understood him to mean that he had made use of the rails of the railroad for the line wire, using the earth for the return circuit. With reference to the use of wire rope, he recollected that when the plan of metallic shutters to shop fronts was first introduced, it was found that great wear and tear was experienced in the friction of the chain by which the shutters were raised and lowered; this had been obviated by the introduction of a rope of twisted wire, sufficiently flexible for the purpose. In the course of the experiments for ascertaining what was a proper material for the purpose, attention was drawn to the means by which the extraordinary flights of ballet aeriels on the Italian stage were effected, which was found to be by means of twisted wire rope, and the idea was at once adopted. The machinery then used for the manufacture of wire rope was the same in almost all its details as was now employed in the manufacture of the outer sheathing of submarine telegraphic cables.

Mr. VARLEY mentioned that his attention had been accidentally directed to the possibility of constructing a telegraph, the signals of which would be communicated by the sense of touch. He had himself been able, by touching the wire whilst an instrument was at work, to interpret the signals by feeling; and he thought possibly this idea might ultimately be practically worked out. Mr. Varley also gave a description of an instrument exhibited by him, termed the acoustic telegraph. He begged to ask Mr. Siemens at what rate the Malta cable was worked?

Mr. SIEMENS replied he believed at the rate of about 12 words per minute, though that very much depended on the skill of the operator.

Mr. VARLEY added that the experiments with the Atlantic cable had led certain electricians to the conclusion that a small wire conducted more rapidly than a large wire, a conclusion with which he (Mr. Varley) did not agree. If it should be established that the larger wire was the best conductor, he did not apprehend that the expense of a submarine cable would be materially increased by its adoption. The cost of the present Atlantic cable was about £100 per mile, of which sum £60 was due to the outer iron sheathing, and £40 to the copper wire and gutta percha covering, and of this he thought the gutta percha cost the larger portion.

Mr. SIEMENS said, in reply to Mr. Smith, that whatever his or Mr. Brett's merits might be in having first suggested the long spiral iron sheathing of electric cables, there could be no doubt about the fact, as stated in the

(Mr. Siemens') paper, that it was actually constructed according to the process patented by Messrs. Newall and Co., for twisting wire ropes. He felt surprised at Mr. Latimer Clark's assertion, that Oersted, Schweigger and Ampère were not the originators of the science of electro-magnetism. The electric charge in underground line-wire was first observed by his brother, Werner Siemens, and fully described in a memoir, presented to the French Academy in 1849, whereas underground line-wire had not been introduced into this country till 1854. He was glad Mr. Clark acknowledged the superiority of the recording over the needle instrument, but did not feel surprised at his defending the latter, very much on the principle upon which one would defend an absent and dying friend. Mr. Highton had also defended the needle instrument, on account of its comparative simplicity and speed. There might be some degree of force in that argument in regard to this country, where the lines were comparatively short, but a needle telegraph was certainly inadmissible for long and international lines of communication. The defects of the needle telegraph system in this country were, however, sufficiently manifest from the distortions of names and figures which occurred in almost every message received. Mr. Siemens could not admit Mr. Highton's argument against the application of magneto-electric and induced currents. Their failure in all the early attempts had been admitted in the paper, and might be very clearly traced to the short duration of the induced current, which rendered it unfit to exercise any sustained or visible mechanical effect upon the receiving instrument; but he mentioned that, in the construction of the instruments he had placed before the meeting, a new and most important feature had been introduced, that of sustaining the effect produced by an instantaneous current, by means of permanent magnets, the instantaneous line-wire current being only required to disturb for an instant of time the equilibrium between two equal and contending poles. Instruments constructed upon this principle required no adjustment according to the distance and other circumstances, which was another very important point, and there was hardly any limit to be assigned, to which the delicacy of the instrument might not be carried. The chief advantage of induced currents for submarine lines, consisted, however, in their perfect equality.—Respecting the new dial instrument, he wished to draw the attention of the meeting to the means adopted to obtain quantitative induced currents by the application of a series of permanent magnets acting in close proximity upon a long rotating keeper, of the section of the letter H, into the recesses of which the induced wire was coiled, by which arrangement a powerful alarm might even be sounded at a distance of 500 miles, to which distance these instruments worked with absolute certainty. The dead-beat ratchet-motion was also of peculiar construction, which rendered the dip of a tooth impossible even at the highest velocity at which the handle of the instrument could be worked. The mode of receiving messages by touch, which had been mentioned by Mr. Varley, was not new, the same plan having been proposed by Vorwiesmann de Heer (see Pogg. Ann., vol. 46, page 513), in 1839. The most suitable diameter of the conductor, in submarine cables, under given circumstances, might be ascertained, without much difficulty, from the simple formula which he had given, and which he had hoped would have formed a principal point in the discussion.

The CHAIRMAN said it was now his pleasing duty to add upon the meeting to join him in a cordial vote of thanks to Mr. Siemens for his very elaborate and valuable paper. He had almost hoped to have heard the battle of magneto electric and battery power fought over again, as he saw advocates of both systems present. Professor Wiedemann was avowedly in favour of the magneto electric power, and there had been of late many important discussions in that direction. — had heard that

evening one extraordinary communication from Mr. Latimer Clark, which came with great surprise upon all who were acquainted with the normal history of electricity. This statement was, that Oersted was not the first discoverer of electro-magnetism. If a priority of discovery were established on behalf of any other person, it would come with great surprise upon those who had been accustomed to associate that discovery with the name of Oersted since the year 1821. The only scintilla of any prior claim to the discovery was that which was vaguely put forward by Ritter, a man who was no doubt very much underrated in his day. The Chairman concluded by proposing a vote of thanks for the paper which had been read.

A vote of thanks was then passed to Mr. Siemens.

The Secretary announced that on Wednesday evening next, the 28th inst., a Paper by Mr. J. Arthur Phillips, "On the Progress and Present State of British Mining," would be read.

ARE MECHANICS' INSTITUTES A FAILURE OR A SUCCESS?

The following letter, addressed to the editor of the *Times*, has appeared in the *Leeds Mercury*.

SIR,—I am sure you would not willingly discount efforts made by the people themselves for their own intellectual and social improvement; yet I fear your remarks, on the 6th instant, relative to Mechanics' Institutions will have that tendency. Will you allow one who has seen a good deal of these institutions, from their origin in England to the present time, to lay before you and your readers facts and considerations which prove that these popular associations have done much good, and may be expected to do much more.

In order to judge correctly of the success already realised, or likely to be realised by Mechanics' Institutions, we must consider the objects for which they were established. Those objects were, to promote the intellectual and moral improvement of young men of the industrial classes, to counteract the temptation to sensual indulgences by which they are beset, to supplement an imperfect education, and to introduce to the study of science or art those whose talents or avocations especially led them to such pursuits. They were not intended to be universities, or colleges of science, or academies of art, to give a high and perfect training, such as would make professors, artists, engineers, &c. This was in the nature of things impossible, seeing that their members consisted of young persons engaged during the day in industrial pursuits, and having only their evenings to spare for study, with scanty means for the purchase of books and materials. The ambition of founders of Mechanics' Institutions was extensive rather than lofty: it was to imbue a whole population with intellectual tastes, not to turn out a few accomplished scholars and artists; it was to circulate books through the homes of the humble classes—not to train authors: it was to assist self-education—not to set up and carry on the complete machinery of education.

Have Mechanics' Institutions, then, in any considerable degree succeeded in attaining these objects? I cannot answer in a very confident or exulting strain, because I know many instances in which they have not effected all that was hoped from them, and some in which for the time they appear to have quite failed. But is there any kind of institution, social or political, governmental or popular, which we can pronounce to be absolutely successful, and especially to have attained all its objects within a single age? Can we assign either perfection or complete success to any of the grand agencies which are carrying on our civilisation—to the pulpit, to the press,

to the university, to the school, to our free political institutions, to parliament itself, to our charities, to our savings banks, to our provident societies, to our administration of justice, to our prison discipline, to our philosophical societies, our academies of art, or our schools of design? In all these things success is partial, and often delayed—perhaps the failures more numerous than the successes; and not unfrequently it is by failure that we learn how to succeed. Our duty is to persevere, to profit by experience, and, if we do not realise all the social improvements we desire, still to press on with a hopeful though modest courage. On the whole, amidst all our failures, society is advancing in knowledge, virtue, and religion—and it is advancing by means of instrumentalities, every one of which we feel to be imperfect.

You have been disheartened by the debts, the mistakes, and the declining numbers of the London Mechanics' Institution. I fear that not a few other instances might be found of similar want of success. But such failures may arise from special circumstances, not from any fault in the principles of the institution. Permit me to mention a few facts, which may revive your hopes concerning this important class of popular associations.

The first Mechanics' Institution formed in England was established in the year 1823. When the census was taken in 1851, returns were received from *one thousand and fifty-seven* Institutions, by far the greater number of which belonged to this class. Dr. Hudson, whose "History of Adult Education" was published in the same year, had obtained independent returns of these Institutions; and he gives a list of 622 Institutions in England and Wales, containing an aggregate of 108,522 members, and with libraries containing 697,355 volumes. We may be certain that neither Dr. Hudson's returns, nor even those of the census, were complete. In the county of York alone, and connected with the "Yorkshire Union of Mechanics' Institutes," we have more than 130 Institutions, containing together 21,000 members, with libraries containing 110,000 volumes, and 300,000 issues of books yearly. At these Institutions, many of which are in villages, an aggregate of 300 lectures were delivered last year. They receive 860 periodicals and 720 newspapers in their reading rooms; the number of pupils in the evening classes is about 6,500; the aggregate yearly income of the Institutions exceeds £11,000. But there are numerous Institutions in this county not connected with our "Union," yet formed on somewhat similar principles.

From these facts may we not take encouragement? Many, like myself, remember the time when neither in our villages nor even in our large towns (with very few exceptions) any of these Institutions existed. At that time, the means of literary and scientific information were extremely few. When Mechanics' Institutions were originated by the practical genius of Dr. Birkbeck, and recommended by the powerful pen of Henry Brougham, they were hailed with delight by the friends of education and improvement, as meeting one of the most crying wants of the age. They consisted of three main features—1st, a library; 2nd, lectures; and 3rd, evening classes. Each of these features is admirably calculated to meet the intellectual wants of the industrial classes. Look, for example, at the library. A working man would perhaps not spend more than ten shillings a year in buying books, and for this sum he might obtain three or four volumes; but suppose 200 working men were to subscribe ten shillings a year each towards a library, they would raise £200, with which they may purchase six or eight hundred volumes, every one of which would be accessible to all the subscribers. If they choose to lay out only one-half or one-quarter of their money on books, they may still form a good library, and add to it a reading room, occasional lectures, and evening classes. From the lectures they may obtain intellectual stimulus and gratification; and in the even-

ing classes—by far the most valuable department of an Institution—the young may acquire solid and systematic knowledge, together with the habit of steady application, which will be invaluable to them in the pursuits of life.

I hope this very simple explanation may be pardoned, for the sake of the practical importance of the subject. Whether we look at the positive or negative effects of Mechanics' Institutions, they are of great social value—negatively, by saving multitudes of our youth from intemperance and vice; and positively, by training them up to be valuable members of society. I know numbers who have risen from the forms of the evening classes to the position of employers and teachers—some to great prosperity and eminence as manufacturers, engineers, professional men, lecturers, and authors.

May I not, then, regard it as proved that Mechanics' Institutions have to a great extent succeeded? But admitting that the success has not been equal to the wishes of their friends, I would point out that they are almost in their infancy, and that they are receiving, and may still hope to receive improvement. The object of our Unions of Mechanics' Institutes is to ascertain and establish the best modes of management, to communicate to each other the results of experience, to encourage, to stimulate, to help, and to form new Institutions. Some of the Unions employ lecturers, exchange written lectures and papers, lend apparatus, establish itinerant village libraries, collect statistics, form catalogues of books, and provide model rules for the management of Institutions.

One of the most recent and valuable improvements consists in the establishment of a system of examinations for the students of Mechanics' Institutions, and the awarding of certificates or prizes to candidates who acquit themselves well. The Society of Arts in London, which itself forms the centre of a great Union of Institutions, organised a plan for this purpose, which has undergone some changes, but which seems likely to lead to very beneficial results. It is designed to stimulate the teachers and students in the evening classes. Last year there was an examination at Huddersfield, chiefly for the Institutions of Yorkshire, when the following number of candidates presented themselves in the subjects specified, namely, 33 in arithmetic, 18 in mensuration, 12 in trigonometry, 5 in conic sections, 3 in natural astronomy, 7 in statics and dynamics, 6 in practical mechanics, 4 in hydrostatics and pneumatics, 3 in electricity, 4 in heat, 7 in chemistry, 1 in physiology, 1 in political and social economy, 17 in English history, 15 in geography, 9 in English literature, 7 in Roman history and Latin, 17 in French, 8 in German, and a considerable number in drawing. This list indicates that a large range of subjects is taught in some of these Institutions, and the reports of the Examiners expressed satisfaction with the attainments of the students.

I may add that these voluntary associations produce two incidental advantages of the utmost value to our social condition. First, they bring into friendly co-operation men of the different ranks of society, of all religious denominations and all political parties, thus binding together the high and the low in bonds of mutual sympathy and regard, and abating the prejudices which too often embitter party and sect. And, secondly, they call forth the self-relying energy of the people, their public spirit and benevolence, in sustaining organisations for their own and each other's intellectual and social improvement. In most other countries of Europe, the people look to their Governments for these things, where any such Institutions exist at all. In England it is our pride to do them for ourselves, as becomes a free people; and the efforts thus put forth cultivate the virtues of the people, and develop more fully the noble spirit of independence which is the only safeguard of liberty. It is in their

voluntary character that the life and power of these Institutions consists. If they should ever accept pecuniary help from the Government, they will put themselves into bondage, as well as into the ruts of routine, which will make their future improvement hopeless. I trust the real friends of popular advancement will never allow themselves to be seduced into so fatal an error.

Mechanics' Institutions have succeeded to the full extent that they could have been expected, if not to the extent we had wished. They are susceptible of continual improvement, and of adaptation to the tastes of the people and the changing circumstances of the times. When well managed, they flourish. When ill managed, they fail, as it is desirable they should, and ere long better Institutions rise in their place. On the whole they are doing immense good, and they deserve to be cherished as one of the best features of the age.—I am, Sir,

Your most obedient servant,

EDWARD BAINES,

President of the Yorkshire Union of
Mechanics' Institutes.

Leeds, April 17, 1858.

PLATINUM OF BORNEO.

COMMUNICATED BY PROFESSOR S. BLEEKRODE, ROYAL
ACADEMY OF DELFT.

Several authors on the statistics of metal mention Borneo as a source of the valuable metal Platinum, so much required in the chemical and industrial arts. There are some who calculate that Borneo can produce from 250 to 400 kilograms yearly. It is surprising, but not the less true, that up to the present time the collection of platinum there has been almost neglected.

In 1831, the resident of Banjarmassin, Mr. Hartman, found the platinum scales in the gold sands, and Dr. L. Horner has confirmed it for all the gold sands that are worked in the valleys of the Ratoes mountains of the Laset district. The observations of this much-lamented naturalist soon found their way into the European journals, having been communicated by Leopold von Bach to Humboldt, who called it "Eine bis jetzt wenig bekannte Erscheinung" (Central Asien, 1843 p. 365).

Dr. Horner estimated the amount of platinum in the gold sands of Borneo as one of platinum to ten of gold, and in this proportion he calculated the eventual produce of that island at 300 kilograms (six cwt. per year), and this could possibly be augmented.

The existence of platinum was afterwards confirmed by other naturalists of the Dutch government. Dr. S. Muller, who visited the southern district of Borneo, has given a description of the diamond mines of Martapoera; after the separation of the diamonds by washing the sands, there remain gold and platinum scales; the gold is carefully collected, but the platinum is rejected as valueless, under the name of *mas kodokh* (gold for the frogs), because neither the Chinese nor the natives know how to work it.

Dr. Schwaner, who travelled through the district of the river Barito and the South-Eastern country, during 1843-47, has given an accurate description of the geological position of the three very valuable minerals, diamonds, gold and platinum, as they are associated together in the diluvium of that island. It appears that the same kind of diluvial *débris* from the rocks of the mountains and hilly districts is found, but the relative proportions of the three valuable minerals in it are very different. Where the diamonds are numerous, gold and platinum are scarce, and, on the contrary, where the grains of the noble metals are abundant, the diamond is rarely found. Gold and platinum are also dispersed over a larger area than the diamonds. The diluvial deposits lie superficially in the higher districts of the rivers and

their mountain tributaries; in the lower country the diluvium is covered by the more recent alluvial deposits of the marshy grounds near the coast. The diluvium consists of conglomerates and rock fragments of diorite, syenite, gabbro, quartz in different colours, but the milky quartz is more general; the minutest parts are quartz sand and magnetic iron-sand. The thickness of the diluvial stratum varies between a few feet and as many fathoms. The depth below the surface is likewise very variable and irregular. The subsoil is a kind of loam, the thickness of which is not yet ascertained.

It is very remarkable, that in some districts the platinum ore contains grains of *cinnabar*, especially at Flahary. We have stated above that the proportion between gold and platinum is as 10:1; but this relation is very variable, because at Katapan it is 5:1, at Soengi-Matjan 20:1.

Last year I received a sample of the Borneo platinum ore, which is now beginning to attract the attention of our commercial society. The results of my analysis are as follows:—

PLATINUM ORE OF BANJARMASSIN.

Separated by solution in { Iron-oxide and iron	1.13
hydrochloric acid. { Copper	0.50
Osmium	1.15
Gold	3.97
Platinum	70.81
Iridium	6.13
Palladium	1.44
Rhodium	0.50
Iron	5.80
Copper	0.34
Insoluble in aqua regia: Osmiridium and	
minerals.....	8.83

The osmium was separated by distillation as described by Berzelius. The analysis was executed, following the method of Berzelius and Claus (*Beiträge zur Chemie des Platin metalle*, 1854). The method of Claus is highly commendable for the ease with which the separation of the platinum from the iron, copper, and gold, is effected.

By the magnet no particles could be separated from the ore. It is probable that this had been done before it was forwarded to Europe. It is interesting here to remark on the magnetic properties of platinum. Berzelius was the first who discovered that there existed a magnetic platinum ore and a non-magnetic ore, notwithstanding that the latter contains nearly the same amount of iron combined as the magnetic ore. His analysis of the platinum ore of Nischnei-Tagilsk, separated into the magnetic and the non-magnetic parts, is generally known, so that it is not necessary to repeat it here. The platinum ore of the Ural, of Pinto in South America, contains likewise a combination or alloy of platinum and iron. The platinum ore, as it is commonly called, is a mixture of different alloys, with iron, copper, and the other platinoid metals. The natural combinations of platinum and iron remind us of the original discovery of this valuable metal, a century ago, when Buffon supposed that the white gold or platinum was not an element but a compound of gold with iron; Bergmann, the Swedish chemist, succeeded in pointing out, in 1777, the elementary condition of the new useful metal. Platinum scales or laminae are frequently covered with *rusty spots* from the iron, and this is removed by hydrochloric acid, as stated in the analysis. The above analysis may be taken as the average of several trials, because the commercial platinum ore is not regular in its composition. Several samples of the same ore, analysed in quantities of two grammes, gave results as follows:—

	A.	B.	C.
Gold	4.62	0.90	1.33
Platinum.....	65.22	71.21	75.03
Iridium	"	9.23	3.32
Insoluble and osmiridium...	9.61	8.18	10.15

Hence it follows, that Mr. Claus was right, viz., that an analysis of platinum ore should not be undertaken with less than ten grammes ($\frac{1}{2}$ ounce Troy).

For the commercial valuation I followed the method of Sobolewsky, as used at the Mint of St. Petersburg. The gold having been separated by boiling in diluted aqua regia, the ore is dissolved in a mixture of three parts hydrochloric acid 25° B, and one part nitric acid 40° B, in the proportion of 10 or 15 parts acid to one part of ore. The result was—

Platinum	70.21
Gold	3.97
Not dissolved	8.83 being osmiridium and minerals.
Iron, copper, iridium, osmium, palladium, &c.	15.88
Iron and copper	1.61 separated previously by hydrochloric acid.
	100.00

It is very remarkable that the platinum appears in small circular or oval laminæ, like drops laminated or flattened, as if struck by a hammer; grains with crystalline facettes could seldom be distinguished. I call this very remarkable, because the gold of the same ore exhibits the form of *pepitas en miniature* or microscopic nuggets, or irregular grains; I saw some small globules and octahedric crystals. The platinum of South America has the same appearance.

In the residue, not dissolved in aqua regia, could be distinguished, as stated by Fremy, the *residu en grains* being the alloy of rhodium, osmium, iridium, and the *residu en paillettes* being iridium, ruthenium, rhodium, osmium. The other mineral constituents of this residue were grains or small pebbles of topaz, hyacinthe, ruby (?), diamond, quartz and feldspar.

It is unnecessary to dwell upon the industrial uses of platinum. I will, however, say a few words upon the metals associated with it, because they hold out the promise of many future useful applications, since Deville, at Paris, has taught the method of melting them. By aid of his lamp, platinum is easily melted. At the last Exhibition in Paris we admired the objects made from molten platinum by Savard, and since then attempts have been made to employ it as a plating for copper for cheap chemical apparatus.

The temperature sufficient for melting 300 grammes (0.3 kilogrammes) of platina, melts 90 to 50 gram (0.04 to 0.05 kilogrammes) of rhodium.

The temperature sufficient for melting 100 to 150 grammes (0.10 to 0.15 kilogrammes), platina melts 10 grammes (0.01 kilogrammes) iridium, which was considered as perfectly infusible.

The iridium is commonly alloyed with platinum; the latter is then less attacked by chemical agents and is much harder, but can be hammered and laminated equally well. A large proportion makes the platinum more brittle.

During last year, M. Chapuis, at Paris, stated that rhodium, alloyed with platinum, formed a combination that could be hammered and laminated without difficulty, and that this combination had the excellent property of not being attacked by aqua regia, and thus the earnest wishes of the practical chemist are satisfied.

The American patent of Batchelder recommends alloying iridium with copper for etching purposes. If this is confirmed by experience there will be a new field opened for a useful application of it. The use of the rhodium for the diamond pens, and of the rhodium for the same purpose, must not be omitted. It is said that one ounce of rhodium fetches in the United States from 2 10s. to £50 according to its purity.

I hope these notices may serve to demonstrate that the platinum metals, scarcely known to the public, even by name, are very valuable substances, requiring further investigation with a view to future useful employment.

The residue of the platinum ore, a few years ago of a very low value, scarcely £4 per lb. avoirdupois, has already risen in price, and is now saleable at four or five times that amount.

SOUTH KENSINGTON MUSEUM.

During the week ending 17th April, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,350; on Monday and Tuesday (free evenings), 3,703. On the three Students' days (admission to the public 6d.), 1,288; one Students' evening, Wednesday, 136. Total, 9,477.

Home Correspondence.

STEAM-SHIP PROPULSION.

SIR,—I had not purposed to take part in the discussion on Mr. McGregor's very interesting paper, read at your meeting on the 14th instant, but having been called upon I could not decline to contribute a few remarks, the expression of which, however, I now beg to amend. Referring to Griffiths's heart-shaped propeller blade, with the narrowest part at the extremity, as distinguished from the ordinary screw with the widest part at the extremity, I intended to observe, that, to have the maximum width at the extremity of the screw has been considered desirable, not, as reported, in order to gain power, but in order to apply the power advantageously by that portion of the propelling surface being the largest where the angle of the blade was supposed to be most favourable to effective propulsion. In prosecution of this idea, the great aim of many inventions has been to neutralize the centre part of the screw, doing the work entirely by means of the extreme portion: for example, some screws are merely flat discs, set at a given angle to the line of the vessel's motion, and fastened to radial arms, the central portion of the screw thus having no propelling effect whatever; and with the same object in view, a screw was designed by myself, with a pitch increasing from the centre towards the circumference, thus neutralising the centre and throwing the great portion of the work upon the extreme portions of the screw. These principles of construction are directly antagonistic to that of Mr. Griffiths. Woodcroft, again, increases the pitch fore and aft, and other screws have been made with both systems of increasing pitch combined; and yet no principle of construction whatever has hitherto been recognised as that which develops the power of the engine with the greatest dynamic effect. This deficiency of our knowledge now, in the twentieth year of the practical application of the screw, is doubtless attributable to the fact that no rule or formula, combining the mutual relations of displacement, power, and speed, as ascertained on trial of a ship, has yet been publicly received and recognised in the mercantile world, as a means of testing the comparative dynamic merits of ships. In fact, at the present day, the character of a steam-ship, as it respects its dynamic properties, is a mere matter of opinionative assertion or braggadocio, not based on any recognized rule involving the mutual relations of displacement, power, and speed that the vessel may, on trial, be found to realize. It has been to remedy this deficiency in marine engineering as a science that I have, for some time past, publicly, through the proceedings of the British Association and of the Society of Arts, and by aid of the *Artisan*, (which periodical has been liberally thrown open for public discussion on this important subject), promulgated the suggestion that great benefit would result to the public interests of the country if every steam-ship, before being taken off the hands of her builders, were put upon a test trial, with a view to her character, as respects dynamic merit, being judged of by the numeric coefficient

or index number resulting from the following rule, namely, Multiply the cube of the speed by the cube root of the square of the displacement, and divide the product by the indicated horse power, or by the consumption of coal per day expressed in cwt., the quotient being regarded as the index number, expressive of the dynamic merit of the ship, or as expressing the comparative dynamic merits of the various ships that may be tested by this rule. This, or any other analogous system of measuring constructive merit by the relative performances of the ships themselves, would give deep-thinking, but unobtrusive, tongue-bound, and personally retiring constructors some chance of attaining that public fame which is one of the rewards of merit, and which every man may landably covet. The public are the great losers by public fame being denied to merit because unobtrusive, and consequently unknown or buried in obscurity. The merit of a constructor should be determined by the performance of his ship, rather than that the merit of a ship should be inferred, and taken for granted, from the personal performances of its constructor. These remarks have been suggested by a practical fact, which, in my various papers on steam-ship capability, I have before publicly referred to, and which I desire to take every opportunity of adducing and promulgating as evidence that steam-ship construction during the past 20 years has not been based on scientific principles, or even on inductive practice conducive to progressive improvement; but it has been in fact a mere "happy-go-lucky" speculation; and the singular fact to which I refer is this, that even at the present day, it is not prudentially safe for any steam-ship constructor to undertake a contract subject to the stipulation that the ship to be built shall, when tested by the rule above referred to, produce a coefficient or index number of dynamic performance equal to that which was produced by one of the first vessels to which the screw propeller was applied, namely, H.M. steam-sloop *Rattler*, which vessel, when immersed to a displacement of 1078 tons, and propelled by engines working up to 437 indicated horse-power, attained a speed of 9.64 nautical miles per hour, producing an index number of dynamic merit, calculated by the rule above enunciated, equal to 215.5. I admit that this index number of dynamic merit has, on several occasions, been surpassed by steamers of later date, but such performances are mere occasional events, not usually attained or definitely accounted for in such manner as admits of their reproduction being calculated upon with such certainty as to be made the subject of contract guarantee. Can such a state of things be regarded as scientific? Surely, steam-ship construction may be expected to embrace a definite realisation of speed with reference to displacement and power, before it can be regarded as a satisfactory development of science and art.

The extent to which private interests are occasionally ruined by the indulgence of injudicious chimeras as to steam-ship capability, and public interests sacrificed by the employment of vessels of a low order of dynamic merit, constitutes a national detriment of enormous magnitude. The shipping interests have it in their power, in great measure, to remedy this, simply by insisting on the dynamic merit of steam-ships being comparatively ascertained by some recognised formula, and regarded as one of the tests of the intrinsic value of ships, and by their affording to ship constructors statistical information as to the performances of ships at sea, whereby the best types of ships would thus become practically determined; the causes of excellence would be detected by comparison of the elements of construction; good ships only would then fetch a good price; constructive talent would be measured by the index number that may be earned by the actual performance. Excellence would thus be recognised, and meet its due reward.—I am, &c.,

CHARLES ATHERTON.

Woolwich Dockyard, 21st April, 1858.

Proceedings of Institutions.

BOSTON.—The seventh annual meeting of the members of the Athenæum was recently held, Thomas Garfit, Esq., president, in the chair. The attendance was larger than usual, and between 200 and 300 voting lists were sent in. The report of the committee for the past year states that the condition and progress of the Institution has, on the whole, been satisfactory—the members numbering nearly the same as at the last annual meeting—the financial position being favourable, and the entire Institution being in good working order in every department. The present number of members is 485. The classification of them, given as follows, shows that the Institution has the support of all classes:—Lif. members 6, members of parliament 4, clergymen 23, magistrates 12, professional gentlemen and bankers 30, shopkeepers 85, manufacturers and tradesmen (not being shopkeepers) 54, shopkeepers' assistants 30, clerks, &c., not in shops 60, country members 60, mechanics 25, schoolmasters and mistresses 16, innkeepers 7, independent gentlemen 20, youths under 21, 38, annual subscribers of one guinea 27, ladies 21. The gross income for the year, including a balance of £36 6s. 1½d. from the previous year, was £308 15s. 2d., and the expenditure £271 5s. 1½d., leaving a balance of £37 10s. 0½d. in hand. Lectures have been delivered by the following gentlemen:—Dr. Cammack, on the "Lays of Ancient Rome," by Macaulay; Herbert Ingram, Esq., M.P., on the "House of Commons;" and by the Rev. P. W. Clayden, on the Proverb, "Where there's a will there's a way." These have been well attended. Other lectures are in prospect. The number of London books had during the year is 420; the issues of the same amount to 5,096; of the Institution's own books (numbering 3,000), the issues were 5,902; and of newspapers and magazines 2,048; making an aggregate of entries amounting to 13,046. A new catalogue of the library has been published during the year. Votes of thanks were passed to the officers and committee, to the lecturers, to the guinea subscribers, and to the auditors. The following is a list of the new committee:—Mr. H. R. Gilson, Rev. P. W. Clayden, Dr. S. A. Cammack, Mr. J. W. Bontoft, Mr. T. Garfit, Mr. W. Garfit, Mr. J. F. Smyth, Mr. W. H. Adams, M.P., Mr. S. H. Jolly, Rev. G. B. Blenkin, Mr. A. Reynolds, Mr. Wise, Mr. P. T. White, Mr. W. E. Chapman, Mr. F. L. Hopkins, Mr. W. S. Greenwood, Mr. C. F. Wright, Rev. T. W. Matthews, Mr. T. Storr, Mr. G. F. Bayley, Mr. J. Noble, Mr. T. Fricker, Mr. J. M. Knowles, Mr. F. Wells, Mr. F. Cooke, Mr. J. Noble, jun., Mr. W. Gee, Mr. A. Spurr, Mr. T. Small, Mr. P. W. Shout, Mr. J. H. Small.

CHELTEMHAM.—Lectures have been regularly delivered during the winter, both to the members of the Literary and Philosophical Institution and to those of the Athenæum; and, though not in continuous courses upon a given subject, many of them have been of considerable value and interest. The liberal donation of £100, from Dr. Disney Thorpe, has helped materially to reduce the debt by which the former of these Institutions had long been impeded in its action; but the financial position, in each case, is still unfavourable. At the Athenæum, instruction classes have been satisfactorily organised, and very well attended.

HOLBECK (NEAR LEEDS).—The evening classes in connection with the Church Institute were closed (with the exception of the drawing class) for the winter session, on the 25th of March. They have been better attended this session than in any previous one, showing that the benefits offered by this Institute to the working classes are appreciated. The Institute was established in October, 1855, for the sole benefit of the operative part of the community resident in the ancient part of Holbeck, and out of 142 members on the books, 130 are of the number of those who belong to the working classes.

The future prospects of the Institute are good; and there is no question but that, next winter, great progress will be made in all the classes.—The penny bank has been in operation for one year and four months, and the results are most satisfactory. 7,046 deposits have been received, amounting to £398 18s. 7d. The withdrawals, during the same period have amounted to £196 5s. 10d.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Delivered on 26th March, 1858.*
64. (7) Trade and Navigation Accounts (28th January, 1858).
 142. Army Stores—Return.
 185. East India (Stock Proprietors)—Return.
 187. Carabel Election Petition—Report from the General Committee of Elections.
 34. Bills—Edinburgh, &c., Annuity Tax.
 39. Bills—Trustees Relief.
Delivered March 27, 29, 30, 31: April 1, 3, 8, 9, and 10, 1858.
 125. East India (King of Oude)—Return.
 140. Metropolis Roads (North of the Thames)—Returns.
 153. Income Tax Returns (London)—Copies of Correspondence.
 165. Emigration—Copies or Extracts of Despatches.
 166. Chinese Prisoners (Hong Kong)—Return.
 131. Customs Tariffs—Return.
 163. Patriotic Fund—1st and 2nd Reports of Commissioners.
 157. Water Companies—Return.
 144. Australian Postal Service (Australian Mails)—Return.
 146. Education—Return.
 152. East India (Colmago, &c.)—Return.
 170. London Mechanics' Institution—Report of Dr. Lyon Playfair.
 95 (A 1). Poor Rates and Pauperism—Return (A).
 136. Revising Barristers—Return.
 148. Highways and Bridges—44th Report of Commissioners.
 150. Colmago—Accounts.
 151. Copper, &c.—Return.
 154. Ironstone (Sootland)—Returns.
 160. Westminster New Palace—Copies of Letters.
 158. East India (Amier Ali Moored)—Correspondence.
 167. East India (Nawab of Surat)—Correspondence.
 27 (1). Navy Estimates—An Abstract and a Reprint of the Revised Votes.
 112. Railway and Canal Bills—General Report of the Board of Trade.
 115. Local Acts (20. Sunderland Dock; 22. North British Railway (Hawick and Carlisle Junction Railway); 23. Llanelli Harbour)—Admiralty Reports.
 117. Railway and Canal Bills (70. Birmingham Canal Navigations; 80. Blackburn Railway; 81. Lancashire and Yorkshire and East Lancashire Railway Companies; 82. Lancaster and Carlisle Railway; 83. London and North Western Railway (Extension from Longlight) and (Additional Works) (No. 2); 84. London and North Western (Additional Works) (No. 1); 85. Manchester, Sheffield and Lincolnshire, and Great Northern Railway Companies; 85. Manchester, Sheffield, and Lincolnshire Railway (Extension to Liverpool); 87. Manchester, Sheffield, and Lincolnshire Railway (Station at Manchester); 88. Manchester South Junction and Altrincham Railway Nos. 1 and 2); 89. Oxford, Worcester, and Wolverhampton Railway; 90. Portsmouth Railway; 91. St. Helen's Canal and Railway; 92. South Wales Railway (Further Powers, &c.); 93. South Wales Railway (New Railway, &c.); Llanelli Harbour, Newport, Abergavenny, and Hereford Railway; 94. Warrington and Stockport Railway (Capital); 95. Warrington and Stockport Railway (Lease or Sale, &c.)—Board of Trade Reports.
 41. Bills—Government of India (No. 2).
 35. —Marriage Law Amendment.
 37. —Medical Practitioners.
 42. —Loan Societies.
 Post Office—4th Report of the Postmaster General.
 The "Cagliari"—Correspondence.
 Public General Acts—Cap. 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Copies of the undermentioned Papers, presented by Command, will be delivered to Members of Parliament applying for the same at the Office for the Sale of Parliamentary Papers, House of Commons.

- Railway Accidents—Report on, 1857.
 As-sessed Taxes—Cases determined on Appeal.
 Births, Deaths, &c. (Scotland)—3rd Report of Registrar-General.
 Turnpike Trusts—1st Report from Secretary of State.
 Endowed Schools (Ireland)—Letter by Mr. A. J. Stephens.
Delivered April 13, 1858.
 4 (1). Banks—Supplemental Returns.
 140. East India (Hewara Ali Akbar)—Correspondence.
 171. Public Income and Expenditure (year ended March 31, 1858)—Account.
 72. Registrar Bills—Account.
 34. Bills—Poor Rates (Metropolis).
 The Excavations at Budram—Papers.
 The "Cagliari"—Appendix to the Correspondence.

Delivered April 14, 1858.

149. Metropolis Rates—Abstract of Returns.
 156. Loan Societies—Atract of Accounts.
 171. Public Income and Expenditure (year ended March 31, 1858)—Account (a corrected Copy).
 113. Harbour, &c., Bills (15. Clyde Navigation)—Board of Trade Reports.

MEETINGS FOR THE ENSUING WEEK.

- MON.Actuaries, 7.
 Architects, 8. Mr. T. L. Donaldson, "Way-side Memoranda of an Architect during a tour in Ireland, more especially with reference to some of its peculiar ancient remains."
 Geographical, 8½. I. Mr. William Lockhart, F.R.G.S., "On the Importance of Opening the Navigation of the Yang-tse-kiang, and the changes that have lately taken place in the bed of the Yellow River, &c." (2nd Part.) II. Mr. James S. Wilson, "Notes on his Journey in North-west Australia."
 TUES.Royal Inst., 3. Mr. J. P. Lacaita, "On the History of Italy during the Middle Ages."
 Civil Engineers, 8. Mr. R. Jacobus Hood, M. Inst. C.E., "On Railway Stations;" and Prof. Airy, Hon. M. Inst. C.E., "Further Explanatory Observations on the Laying of Telegraph Cables."
 Med. and Chirurg., 8½.
 Zoological, 9.
 WED.Society of Arts, 8. Mr. J. A. Phillips, "On the Progress and Present State of British Mining."
 Geological, 8. I. Mr. C. Bunbury, "On Fossil Leaves from Madeira." II. Mr. E. W. Binney, "On the Structure of Stigmatica Fossides." III. Mr. J. W. Dawson, "On the Lower Coal-measures of British America." IV. Rev. T. Brown, "On some Relations of the Scottish Coal-measures." V. Mr. J. Morris, "On a species of Fern from the Coal-measures of Worcestershire."
 Archaeological Asso., 8½.
 THURS.Zoological, 1. Anniversary.
 Royal Inst., 3. Prof. Tyndall, "On Heat."
 Royal Society Club, 6.
 Antiquaries, 8.
 Royal, 8½.
 FRI.London Inst., 8. Anniversary.
 United Service Inst., 3. Capt. Schaw, "On Gunpowder as a Disruptive Agent."
 Royal Inst., 8½. Prof. A. C. Ramsay, "On the Geological Causes that have influenced the Scenery of Canada, and the North-eastern Provinces of the United States."
 SAT.Royal Inst., 2. Annual Meeting.
 Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, April 16, 1858.]

Dated 12th March, 1858.

498. M. Smith, Heywood, Lancashire—Imp. in looms for weaving.
 508. J. T. Coupler, Paris—Treating vegetable fibrous matters, to render them applicable for the manufacture of paper and pasteboard, and in apparatus connected therewith.

Dated 15th March, 1858.

526. J. Aked and J. Crabtree, Halifax—Imp. in the arrangement of machinery or apparatus for warping and beaming yarns for weaving.

Dated 20th March, 1858.

588. J. T. Pitman, 67, Gracechurch-street—Imp. in the manufacture of soap, and in the apparatus connected therewith. (A com.)
 589. J. T. Pitman, 67, Gracechurch-street—Imp. in the mode of preparing and moulding clay into bricks, tiles, pipes, and other similar manufactures. (A com.)

Dated 22nd March, 1858.

594. G. Davies, 1, Serre-street, Lincoln's-inn—Imp. in the metallization of objects for the electrotype or galvanoplastic process. (A com.)
 598. J. Wright, 10, Alfred-place, Newington Causeway—An improved method of, and apparatus for, punching rolled metal plates and angle iron. (A com.)

Dated 24th March, 1858.

622. W. Wood and E. Wood, Radcliffe, Lancashire—Imp. in machinery or apparatus for spinning, doubling, and sizing yarns or threads.
 634. J. Young, Knowsboro—Improved apparatus for signalling on railways by day and night.

Dated 26th March, 1858.

638. W. Moxon, J. Clayton, and S. Fearnley, Bluntpits, Lancashire—Imp. in machinery for paying out electric telegraph cables, ropes, and other like articles.
 640. J. Parkes, Birmingham—An imp. or imp. in eyelets.
 642. R. M. Butt, Fairfield Works, Bow—Imp. in the manufacture of night lights.

Dated 27th March, 1858.

646. V. F. Jeanne and E. M. G. Martin, Paris—A machine for breaking stones.
650. J. Bushell and T. Wright, Manchester—Imp. which make grids for covering openings, through which fuel is deposited, in vaults or cellars, self-securing.
652. W. W. Eley, Broad-street, Golden-square—Imp. in cartridges.
654. J. A. V. Burq, Paris—Imp. in weighing machines.

Dated 29th March, 1858.

658. W. Garnett and C. Geldard, Low Moor, near Clitheroe, and J. Dugdale, Blackburn, Lancashire—Imp. in looms for weaving.
660. W. Chadwick, Bury—Imp. in the hoods or tops, and in the footstep and bearings of ventilators.
662. J. Horton, Smethwick, Staffordshire—New or improved machinery to be employed in punching metals.
664. J. C. Durand, Pimlico—An imp. in the manufacture of chain cables.
666. G. Paterson, Glasgow—Imp. in apparatus for effecting the combustion of fuel and the consumption or prevention of smoke, applicable to boiler furnaces.
668. W. Davis, 11, George-street, Chick's buildings, and T. Harper, Brewery-house, Broadplains, St. Philip's, Bristol—Imp. in apparatus for cutting soap.

Dated 30th March, 1858.

670. F. Robinson and E. Cottam, Pimlico—Imp. in hydrostatic and other presses.
672. W. Weallens, 12, Elswick-villas, Newcastle-upon-Tyne—Imp. in parabolic governors, and in the mode of applying the same to steam engines.
674. T. Steven, T. Reid, and T. Frew, Glasgow—Imp. in making moulds for casting.
676. W. G. Whitehead, Birmingham—A new or improved water-proof paper.
678. W. Oldfield, Skipton, and T. O. Dixon, Steeton, Yorkshire—Imp. in gas burners.

Dated 31st March, 1858.

680. J. Musgrave, jun., Globe Iron Works, Bolton-le-Moors—The application of the heat from the furnaces of singeing or dressing plates to generating steam and drying purposes, and imp. in the construction of such furnaces.
682. J. W. Duco, Wolverhampton—Imp. in locks and latches, and in attaching knobs to lock and latch spindles.
684. J. H. Whitehead, Royal George Mills, Saddleworth, Yorkshire—Imp. in making woollen bags.
686. J. Mercer, Cambridge, U.S.—Imp. in the manufacture of leather.
688. H. Napier, Hyde-road, Ardwick, Manchester—An improved process in the production of volatile oil of resin.
690. R. Peter, Dundee—Imp. in gill machinery for the preparation or manufacture of textile materials.

Dated 1st April, 1858.

692. A. Pelez, 91, Mortimer-street, Cavendish-square—Imp. in hydraulic machines. (A com.)
693. E. A. Colette, Dieppedalle, near Rouen, France—Hashing meat with a mechanical chopping-board.
694. A. P. Dudley, New Hall-street, and N. Brough, Birmingham—An improved buckle or metallic adjuster for adjusting braces, belts, garters, and such like articles of dress.
695. F. K. Tavernier and J. A. F. Tavernier, 213, Rue Saint Dominique, St. Germain, Paris—Imp. in machinery for combing wool or other fibrous materials.
696. F. J. E. O. sterilock, Paris—An improved valve or plug for the passage of water or other fluids.
697. H. Ward, Hamburg—Improved machinery for expressing liquids from organic substances.
698. W. E. Newton, 66, Chancery-lane—Improved machinery for manufacturing corks. (A com.)
699. E. Bentley, Horton, near Bradford—Certain imp. in machinery or apparatus employed in preparing and spinning worsted and other fibrous substances.
700. T. Boardman, Pendleton, and J. Alcock, Stockport—Imp. in
701. C. G. Russell, Manchester—Imp. in machinery or apparatus for

702. T. S. Macdonald, Halifax—Imp. in apparatus for cutting cork.
703. T. Greenhalgh, 11, Little Titchfield-street—Imp. in treating mineral waters produced from coal in making gas and producing useful products for making artificial manure.
704. Y. Goussier, 11, Avenue de la République, Paris—An imp. in the construction of steam engines for the use of vessels.
705. A. Pelez, 91, Mortimer-street, Cavendish-square—A new steam engine for horizontal and vertical engines. (A com.)
706. J. H. Sullivan, 67, Lincoln's-inn-fields—Imp. in ships' propellers. (A com.)
707. C. T. Jones, 11, Lincoln's-inn-fields—Imp. in or applicable to the class of sails made from palm leaf, grass, chip, Tuscan, Leghorn, Panama straw, and other like materials.

710. J. Fowler, junr., 28, Cornhill—Imp. in apparatus used when ploughing, tilling, or cultivating land by steam power.
711. W. Crowley, Newport Pagnell—Imp. in combining and working ploughs.
712. D. Morrison, Birmingham—Imp. in boiling oils.
713. H. Cartwright, Dean, Broseley, Shropshire—Imp. in the construction of excentrics and in the mode of working them when applied to steam engines.
715. S. Minton and B. H. Thomas, Clough Hall Collieries, Staffordshire—An improved construction of battery.
716. E. Targett, Windmill-street, Finsbury—Imp. applicable to lamp-glasses or shades.
717. A. V. Newton, 66, Chancery-lane—Imp. in machinery for cutting veneers. (A com.)
718. J. Stobbs, Sydney-street, and G. R. Hall, Linskill-street, North Shields—Imp. in pumps for raising water and other liquids.

Dated 6th April, 1858.

719. W. Clark, 53, Chancery-lane—An improved construction of water tank for ships and other vessels, and mode of applying the same on board a vessel, whereby it is capable of conversion into a float for saving life and property in case of the foundering of the vessel. (A com.)
721. J. C. Dieulalait, 2, Rue Sainte-Apolline, Paris—An improved method of manufacturing garments, whereby one garment may be changed in form to that of several others.
722. R. C. H. Groombridge and H. Groombridge, 6, Paternoster-row, and J. Mussellwhite, 19, Aldersgate street—Imp. in a black board and apparatus for teaching music.
725. O. Serony, Scarborough—Imp. in producing photographic portraits.

Dated 6th April, 1858.

727. W. B. Webster, Adam-street—An imp. in making of butter.
729. E. Owen, Blackheath—Imp. in the manufacture or production of artificial fuel, and in the application of the same to metallurgical purposes.
731. R. Hornsby, junr., Spittlegate Works, Grantham—Imp. in ploughs.
733. H. Schwieterz, J. Holder, and J. Broughton, Scarp Castle, Brighton—Concentrating and retaining the valuable properties of farm yard and stable manure.
735. D. Davy, W. Bentley, and J. Davy, Bradford—Certain imp. in looms employed for weaving.
737. J. Sangster, Newington—Glazing in wood without patty.
739. R. H. Collyer, Marylebone—Imp. in the manufacture of paper. (A com.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

749. E. Foster, Connecticut, U.S.—A new and useful or improved life-preserving berth for navigable vessels.—7th April, 1858.
752. S. O. Mason, Connecticut, U.S.—Certain new and useful improvements in door hinges. (A com.)—8th April, 1858.
753. E. Richmond, Massachusetts, U.S.—Certain new and useful mechanism for reducing, or reducing and crushing, and is various other respects treating grain, sugar cane, tobacco, or other substance or substances. (Partly a com.)—8th April, 1858.

WEEKLY LIST OF PATENTS SEALED.

- April 16th.
2648. D. Guthrie and J. Vavasour.
2657. J. Bentley.
2659. J. Eastwood.
2660. R. A. Brooman.
2661. L. de Cristoforis.
2666. J. Schmidt.
2672. H. Wimbull.
2675. W. Bentham.
2706. A. V. Newton.
2736. W. Clark.
2750. W. Padgett.
2770. L. de Landfort.
2778. J. L. Norton and E. Wilkinson.
2862. H. Bessemer.
2912. T. F. Brabson & G. Hughes.
42. J. A. M. Chausfour.
284. P. Molinari.
370. W. K. Foster.
- April 20th.
2661. G. H. Smith.
2684. C. Tooth and W. W. Wayne.
2689. R. Duke.
2691. J. Bethell.
2696. J. Milne.
2699. J. Smith.
2704. W. H. H. Akerman.
2712. J. J. Schuessel and P. J. Thourer.
2715. F. B. Kyliabogloo.
2762. M. F. Luard.
2783. C. Iles.
2837. T. Rowellife.
2897. W. Smith.
237. C. Askew and D. Ritchie.

PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID.

- April 12th.
816. J. Templeton.
858. J. Lawson and S. Dear.
- April 15th.
863. J. Cowley and D. P. Sullivan.
841. P. A. Dery.
849. H. Woodhouse.
1045. G. Taylor.
- April 18th.
845. E. E. Allen.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register	Date of Registration	Title	Proprietor's Name	Address
4416	April 11.	Improved Lamp	T. Trum	Chester.
4419	" 20.	Improvement in the mode of securing and Ventilation	W. M. Stanton	Birkenhead, Cheshire.

Journal of the Society of Arts.

FRIDAY, APRIL 30, 1858.

EXAMINATIONS.

The following letter has been received, in reply to a request made by the Council to Lord Derby, that his Lordship would place at their disposal nominations to compete for Clerkships, and other Government situations of a similar character, as rewards to successful candidates at the Society's ensuing Examinations :—

Treasury, S.W., 28th April, 1858.

SIR,—Lord Derby has communicated to me the request of the Society of Arts, made through you, that a certain number of nominations to appointments under his Lordship's control may be placed at the disposal of the Society, and I beg to inform you that, in accordance with the wishes expressed by the Society, Lord Derby will be prepared to nominate four candidates during the present year, to compete for such clerkships and other similar situations as may fall to his Lordship's disposal.

I shall be obliged, therefore, if you will have the goodness to inform me, at your convenience, of the names and addresses of the four candidates whom the Society would

desire to recommend, in order that their names may duly be recorded as desirous to compete for appointments.

I am, Sir,

Your obedient servant,

WM. G. HYLTON JOLLIFFE.

The Secretary of the Society of Arts.

THE SOCIETY'S CONVERSAZIONE AT THE SOUTH KENSINGTON MUSEUM.

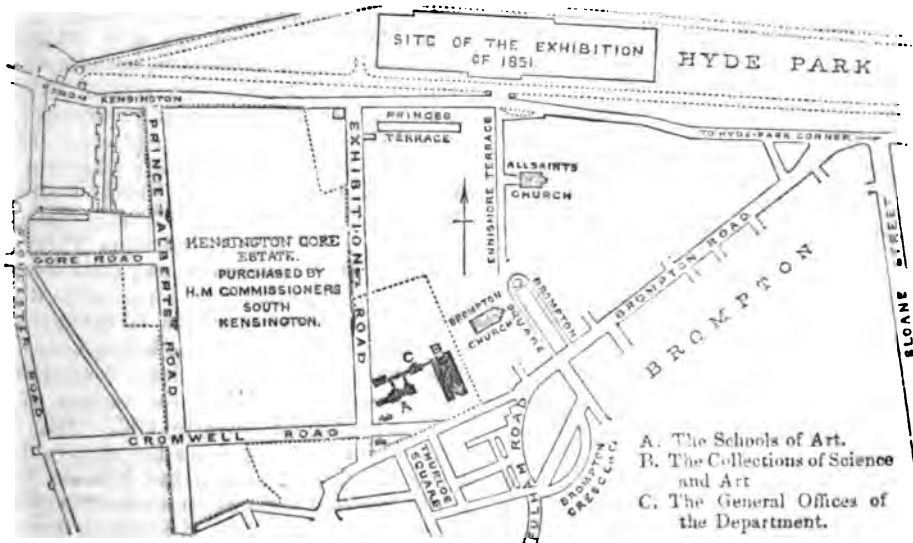
Members are requested to take notice that the next Conversazione will be held at the South Kensington Museum, on Saturday, the 8th of May. The doors will be opened at 8 o'clock.

The following divisions of the Museum will be lighted on this occasion :—

1. The Sheshshanks Gallery of Pictures.
2. The Sculpture Gallery.
3. The Architectural Museum.
4. The Animal Produce Collections.
5. The Ornamental Art Collections.
6. The Structure and Building Materials Collections.
7. The Educational Collections.
8. The Collection of Patented Inventions.
9. The Photographic Society's Exhibition.
10. The Art Training Schools.

Carriages are to set down at the refreshment entrance. The band of the Royal Horse Guards (Blue) will be in attendance.

The following plan shows the position of the new Museum at Kensington.



TENTH ANNUAL EXHIBITION OF INVENTIONS.

The Exhibition was opened on Monday, the 5th instant.

The Exhibition will remain open every day until further notice, from 10 a.m. to 4 p.m., and is free to members and their friends. Members, by ticket, or written order bearing their signa-

ture, may admit any number of persons. The number of visitors up to yesterday, the 29th inst., was 3,782.

LOCAL BOARDS—PREVIOUS EXAMINATION.

Fifty Local Boards have been formed. P turns of the Candidates who have passed

Previous Examination have been received, as follows :—

Louth	4
Wigan	6
West Hartlepool	3
Leeds (Christian Institute). No. 1.	14
Northowram	1
Portsmouth	2
Warminster	1
Banbury	2
Macclesfield	23
Newcastle-on-Tyne	3
Lymington	1
West Brompton	4
Leeds, No. 2.	10
Wakefield	4
Pembroke Dock	4
Ipswich	6
London Mechanics' Institution	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	18
Halifax, No. 1.	15
Salisbury	1
Sheffield	18
Liverpool	35
Lockwood	1
Halifax (Working Men's College), No. 2.	21
York	7
Berkhamstead	19
Bristol	11
London Domestic Mission	1
Royal Polytechnic Institution	28
Birmingham, No. 1, Messrs. Chance's Reading Room	2
Shcreness	1

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date :—

T. D. Acland, Member of Council	£ 5 5
The Rt. Hon. C. B. Adderley, M.P.	5 0
John Ames	5 5
J. G. Appold, F.R.S., Auditor	10 10
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
H. D. Cunningham, R.N.	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation)	10 10
F. Seymour Haden (annual)	2 2
William Hawksworth	1 1
Edward Highton (annual)	£ 2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Coun- cil (second donation)	10 10
George Moffatt, M.P., Vice-Pres.	10 10
Lieut.-General Sir Charles Pasley, K.C.B.	5 0
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford	1 1

Charles Ratcliff, Hon. Local Sec. (annual)...	10 10
Joseph Skey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council } (third donation)	10 10

CONVERSAZIONE.

The first Conversazione of the present Session was held on Saturday evening last, at the Society's House. The whole of the rooms were thrown open, and in the great room was displayed a series of upwards of sixty drawings of curious modes of marine propulsion, which had been prepared and were kindly lent by Mr. J. MacGregor.

In addition to the above, a collection of models, illustrative of the same subject, and patented between the years 1794 and 1850, were kindly lent by Mr. Brunet, the surviving partner of the late firm of Seaward and Co., and from the Museum of the Commissioners of Patents at Kensington. Mr. Tomkins kindly attended, and exhibited, by the aid of one of Ross's finest microscopes, the Infusorial Animalcules alluded to by Mr. MacGregor in his Paper "On the Paddle Wheel and Screw Propeller," read before the Society on Wednesday, the 14th inst.

In the Great Room was also arranged a historical series of Telegraphs, including Wheatstone's first Six-line Wire Needle Telegraph, and the needle instruments at present in general use; Wheatstone's Magneto-Electric Dial and Capstan Instruments; Baines's Chemical Telegraph; E. Highton's Single Needle Instrument; M. E. Henley's Magnetic Needle Telegraph; Siemen's and Halske's Induction Relay, their Magnetic Dial Instrument, and their Recording Instrument for Submarine Lines, as well as Mr. Varley's Instrument, worked in connexion with the Dutch Cable Line. The instruments were in operation during the evening. Messrs. Newall exhibited a collection of the various Electric Telegraph Cables hitherto laid. Mr. James Winter, jun., exhibited his Locomotive Engine for common roads, called the "Steam Horse," which is stated to possess considerable power of ascending inclines. In the Committee Room was also a Model of the New Life Boat recently adopted by the Shipwreck Institution, as well as a unique specimen of Double Refracting Iceland Spar, by Professor Tennant. The Exhibition of Patents in the lower rooms was thrown open.

The thanks of the Council are specially due to those gentlemen who kindly contributed their models and specimens on this occasion.

TWENTIETH ORDINARY MEETING.

WEDNESDAY, APRIL 28, 1858.

The Twentieth Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 28th inst., Thomas Sopwith, Esq., M.A., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Addis, William	Cormack, John Rose, M.D.
Ashton, Thomas J.	Lewis, John Frederick

The Paper read was—

ON THE PROGRESS AND PRESENT STATE OF BRITISH MINING.

By J. ARTHUR PHILLIPS.

The metals sought by the miner usually occur in combination with either sulphur or oxygen, or their oxides may themselves be combined with an acid, giving rise to carbonates, phosphates, sulphates, &c. In this state they are said to be mineralised, and the unproductive substances with which they are associated are known as the matrix or gangue. When such a mixture contains a sufficient proportion of mineral to enable it to be advantageously treated, it is known as an ore of the metal which it contains.

Metalliferous ores are derived either from veins or beds, but gold, and the finer descriptions of oxide of tin, are chiefly obtained by washing certain alluvial deposits, consisting of the *débris* of veins yielding these metals.

Veins or lodes have been defined, by Werner, to be "mineralised repositories of a flat or tabular shape, which traverse strata, without regard to their stratification, having the appearance of rents formed in the rocks, and afterwards filled up with mineral matter, which differs, more or less, from the rocks themselves."

The most important ore occurring in beds is iron-stone. This is frequently found interstratified with the coal, sandstones, and shales of the coal measures, and preponderates in value over every other mineral deposit worked in this country.

The methods of working these several forms of deposit, and the subsequent preparations of the ores obtained, have from time to time received various modifications and improvements, and these will form the chief subject of the present paper.

It would appear that silver and gold were known to the Britons before the Roman invasion, since coins of these metals were in circulation among them before the arrival of Cæsar. Cæsar and Strabo both state that the Britons obtained their copper from foreign countries, from which it may be inferred that the art of refining this metal was but little cultivated by our forefathers at that remote period. Iron is described by Cæsar as being so rare in Britain that pieces of it were employed as a medium of exchange; but, a century later, it had become exceedingly common, since in Strabo's time it was an article of exportation.

Tin was anciently, however, the most celebrated metallic product of Britain, and appears to have been obtained in considerable quantities, since it was the desire of obtaining possession of the tin mines, and thereby becoming independent of the Phœnician monopoly, which first induced the Romans to visit this island.

Before the conquest of their country, the ancient Britons extracted tin from its ores by methods which they had themselves discovered, and which were probably improved by their conquerors. The broken and rudely-

washed ore was placed in a hole cut in the ground, the sides of which were lined with fuel, and this being ignited, reduced the metal, which was run off into an outer receptacle. Many of these rude furnaces have been discovered in various parts of Cornwall, in which not only charcoal and slags have been found, but also portions of reduced metal, which, in some instances, from long exposure to oxidising influences, have again become partially converted into peroxide.

The remains of these ancient establishments are known by the name of "Jew's Houses," and, a short time since, a remarkable relic of this description was found buried beneath a stratum of peat, twelve feet in thickness, at Redmoor, in the parish of Luxullian, Cornwall.

At this place, in addition to a considerable amount of metallic tin, more or less oxidised, on the exterior, large quantities of imperfectly fused scoriae, mixed with imbedded charcoal and metallic globules, were discovered. A Romano-British fibula, some stone arrow-heads, a piece of bronze, a wooden shovel, and another shovel of wood tipped with iron, were also found, together with a fragment of an earthen "tuyere," and numerous blocks of peat, which had evidently been collected for the purpose of being employed as fuel by the ancient smelters, and had subsequently become covered by a deposit of the same material.

A large proportion of the objects found in this locality will be found lying on the table.

The form of bellows employed in these rude smelting works cannot now be determined, but two very simple methods of obtaining a current of air for such purposes are given in the diagrams on the walls of the room. The first of these represents bellows, from an Egyptian painting after Rosellini. The men are here represented as blowing a charcoal fire, to each side of which is applied a pair of bellows. These are worked by the feet, the operators standing upon and pressing them down alternately, whilst they pull up each exhausted skin by means of a string held in the hand. The second diagram represents the bellows employed for the manufacture of wootz, by the natives of India.

Another ancient smelting establishment, found in the same neighbourhood, was probably of a much more recent date, since not only were some portions of the stonework still remaining, but the slags were more completely fused, and entirely free from any admixture of metallic globules. These slags, of which specimens will be found on the table, were found, on analysis, to have the following composition :—

Silica	40.60
Alumina	19.22
Oxide of tin.....	22.95
Protoxide of iron.....	7.31
Sulphide of iron	9.04
Lime.....	traces
Potash	1.00
	100.12

In this place there were also discovered some tobacco pipes and a coin of Charles I.

Previous to the time of Charles no attempt had been made to effect the smelting of tin by means of pit coal; but, at this period, some unsuccessful experiments were undertaken by Sir Beville Grenville, of Stow, in the county of Cornwall. No satisfactory results were, however, obtained until the second year of the reign of Queen Anne, when a Mr. Liddell, of Bodmin, who was associated with Mr. Moul, at that time celebrated as a chemist, obtained a patent for the reduction of tin ores in a blast furnace, by means of fossil fuel. The invention of the reverberatory furnace soon followed this discovery, and this apparatus, slightly modified in form and dimensions, is that employed by the tin smelters of the present day.

The "rough lot" specimens are those at Cambridge and the other three sites, and the "smooth lot" specimens are those at the other three sites. The specimens are all of the same size, and are all of the same shape. The specimens are all of the same color, and are all of the same texture. The specimens are all of the same material, and are all of the same quality. The specimens are all of the same age, and are all of the same origin. The specimens are all of the same type, and are all of the same variety. The specimens are all of the same sex, and are all of the same gender. The specimens are all of the same species, and are all of the same genus. The specimens are all of the same family, and are all of the same order. The specimens are all of the same class, and are all of the same phylum. The specimens are all of the same kingdom, and are all of the same domain. The specimens are all of the same life, and are all of the same universe.

On 11 January 1941, the 1st Marine Division was alerted to move to the island of Iwo Jima. The division was composed of the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st, 32nd, 33rd, 34th, 35th, 36th, 37th, 38th, 39th, 40th, 41st, 42nd, 43rd, 44th, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th, 59th, 60th, 61st, 62nd, 63rd, 64th, 65th, 66th, 67th, 68th, 69th, 70th, 71st, 72nd, 73rd, 74th, 75th, 76th, 77th, 78th, 79th, 80th, 81st, 82nd, 83rd, 84th, 85th, 86th, 87th, 88th, 89th, 90th, 91st, 92nd, 93rd, 94th, 95th, 96th, 97th, 98th, 99th, 100th, 101st, 102nd, 103rd, 104th, 105th, 106th, 107th, 108th, 109th, 110th, 111th, 112th, 113th, 114th, 115th, 116th, 117th, 118th, 119th, 120th, 121st, 122nd, 123rd, 124th, 125th, 126th, 127th, 128th, 129th, 130th, 131st, 132nd, 133rd, 134th, 135th, 136th, 137th, 138th, 139th, 140th, 141st, 142nd, 143rd, 144th, 145th, 146th, 147th, 148th, 149th, 150th, 151st, 152nd, 153rd, 154th, 155th, 156th, 157th, 158th, 159th, 160th, 161st, 162nd, 163rd, 164th, 165th, 166th, 167th, 168th, 169th, 170th, 171st, 172nd, 173rd, 174th, 175th, 176th, 177th, 178th, 179th, 180th, 181st, 182nd, 183rd, 184th, 185th, 186th, 187th, 188th, 189th, 190th, 191st, 192nd, 193rd, 194th, 195th, 196th, 197th, 198th, 199th, 200th, 201st, 202nd, 203rd, 204th, 205th, 206th, 207th, 208th, 209th, 210th, 211th, 212th, 213th, 214th, 215th, 216th, 217th, 218th, 219th, 220th, 221st, 222nd, 223rd, 224th, 225th, 226th, 227th, 228th, 229th, 230th, 231st, 232nd, 233rd, 234th, 235th, 236th, 237th, 238th, 239th, 240th, 241st, 242nd, 243rd, 244th, 245th, 246th, 247th, 248th, 249th, 250th, 251st, 252nd, 253rd, 254th, 255th, 256th, 257th, 258th, 259th, 260th, 261st, 262nd, 263rd, 264th, 265th, 266th, 267th, 268th, 269th, 270th, 271st, 272nd, 273rd, 274th, 275th, 276th, 277th, 278th, 279th, 280th, 281st, 282nd, 283rd, 284th, 285th, 286th, 287th, 288th, 289th, 290th, 291st, 292nd, 293rd, 294th, 295th, 296th, 297th, 298th, 299th, 300th, 301st, 302nd, 303rd, 304th, 305th, 306th, 307th, 308th, 309th, 310th, 311th, 312th, 313th, 314th, 315th, 316th, 317th, 318th, 319th, 320th, 321st, 322nd, 323rd, 324th, 325th, 326th, 327th, 328th, 329th, 330th, 331st, 332nd, 333rd, 334th, 335th, 336th, 337th, 338th, 339th, 340th, 341st, 342nd, 343rd, 344th, 345th, 346th, 347th, 348th, 349th, 350th, 351st, 352nd, 353rd, 354th, 355th, 356th, 357th, 358th, 359th, 360th, 361st, 362nd, 363rd, 364th, 365th, 366th, 367th, 368th, 369th, 370th, 371st, 372nd, 373rd, 374th, 375th, 376th, 377th, 378th, 379th, 380th, 381st, 382nd, 383rd, 384th, 385th, 386th, 387th, 388th, 389th, 390th, 391st, 392nd, 393rd, 394th, 395th, 396th, 397th, 398th, 399th, 400th, 401st, 402nd, 403rd, 404th, 405th, 406th, 407th, 408th, 409th, 410th, 411th, 412th, 413th, 414th, 415th, 416th, 417th, 418th, 419th, 420th, 421st, 422nd, 423rd, 424th, 425th, 426th, 427th, 428th, 429th, 430th, 431st, 432nd, 433rd, 434th, 435th, 436th, 437th, 438th, 439th, 440th, 441st, 442nd, 443rd, 444th, 445th, 446th, 447th, 448th, 449th, 450th, 451st, 452nd, 453rd, 454th, 455th, 456th, 457th, 458th, 459th, 460th, 461st, 462nd, 463rd, 464th, 465th, 466th, 467th, 468th, 469th, 470th, 471st, 472nd, 473rd, 474th, 475th, 476th, 477th, 478th, 479th, 480th, 481st, 482nd, 483rd, 484th, 485th, 486th, 487th, 488th, 489th, 490th, 491st, 492nd, 493rd, 494th, 495th, 496th, 497th, 498th, 499th, 500th, 501st, 502nd, 503rd, 504th, 505th, 506th, 507th, 508th, 509th, 510th, 511th, 512th, 513th, 514th, 515th, 516th, 517th, 518th, 519th, 520th, 521st, 522nd, 523rd, 524th, 525th, 526th, 527th, 528th, 529th, 530th, 531st, 532nd, 533rd, 534th, 535th, 536th, 537th, 538th, 539th, 540th, 541st, 542nd, 543rd, 544th, 545th, 546th, 547th, 548th, 549th, 550th, 551st, 552nd, 553rd, 554th, 555th, 556th, 557th, 558th, 559th, 560th, 561st, 562nd, 563rd, 564th, 565th, 566th, 567th, 568th, 569th, 570th, 571st, 572nd, 573rd, 574th, 575th, 576th, 577th, 578th, 579th, 580th, 581st, 582nd, 583rd, 584th, 585th, 586th, 587th, 588th, 589th, 590th, 591st, 592nd, 593rd, 594th, 595th, 596th, 597th, 598th, 599th, 600th, 601st, 602nd, 603rd, 604th, 605th, 606th, 607th, 608th, 609th, 610th, 611th, 612th, 613th, 614th, 615th, 616th, 617th, 618th, 619th, 620th, 621st, 622nd, 623rd, 624th, 625th, 626th, 627th, 628th, 629th, 630th, 631st, 632nd, 633rd, 634th, 635th, 636th, 637th, 638th, 639th, 640th, 641st, 642nd, 643rd, 644th, 645th, 646th, 647th, 648th, 649th, 650th, 651st, 652nd, 653rd, 654th, 655th, 656th, 657th, 658th, 659th, 660th, 661st, 662nd, 663rd, 664th, 665th, 666th, 667th, 668th, 669th, 670th, 671st, 672nd, 673rd, 674th, 675th, 676th, 677th, 678th, 679th, 680th, 681st, 682nd, 683rd, 684th, 685th, 686th, 687th, 688th, 689th, 690th, 691st, 692nd, 693rd, 694th, 6

[illegible]

was a laborer employed as such until the death of Charles I. It is, however, shown in documents anterior to the reign of Henry VIII that in 1504, there were admitted by his father to the inhabitants of Newcastle were permitted to dig for coal on paying an annual rent. That this fuel had been introduced into the town before 1506 is proved by the fact that in 1506 its use was prohibited from the supposed tendency of its smoke to "corrupt" the atmosphere.

coal-fields of Chislev, near Lancaster, were first opened in the year 1830; those at Merrington and Farncliffe in 1835, and those of Gateshead, Wickham, and Worsington, in the year 1840. The coal-fields of the West-riding have been estimated to contain an area of 2,000 square miles. The present vend of coal is at 2,000,000 tons per month. This is obtained from 100,000 acres.

The annual yield of our mineral products now amounts to \$200,000,000, and any estimate of the value which this sum ultimately assumes after the metals have been subjected to more or less complicated elaboration, must be merely hypothetical.

Mining Operations.

DEPT. ACC.—It being impossible to compress within the limits of a single paper even a very brief sketch of the various systems of mining resorted to in this country, I shall confine my observations to the method employed in the working of mineral veins, and endeavour accurately to trace the operations of the miner from the time of selecting a piece of ground for exploration up to the period of his forwarding his dressed ores to market. While making this, I shall also point out some of the more striking improvements which have been introduced, and direct attention to the direction from which further advantages may be anticipated.

The minerals of Great Britain do not, as in many continental countries, belong solely to the crown, but are generally the property of private individuals. The mineral and surface rights are, moreover, not always united, and, consequently, the mineral lord may be in receipt of an income from mining operations, whilst the surface pro-

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riety, whose land is destroyed, receives little or no compensation.

In most of our mining districts the veins cannot be explored without the express consent of the proprietor, but in certain exceptional localities they may be attacked without any special license or authorisation. In such cases tradition and custom constitute the acting covenants, and necessitate each individual miner to become a conservator of the general privileges.

The consideration given for the right of exploring the contents of a vein is usually a fixed proportion of the value produced, rendered either in kind or money, and technically known as royalty. This is secured to the owner by a lease, which embraces a variety of covenants with the lessee relative to the management of the property, and which remains in force during a stated number of years.

The operations of the lessee are confined within certain specified limits, called a *Sett*, within which, subject to various restrictions, he may work as he thinks proper. Previous to obtaining a lease, the miner sometimes works under what is called a *take-note*, extending over a period of one or more years. This document is more simple than a lease, and its cost comparatively trifling.

SINKING.—When a piece of ground has been selected, and a *take-note* or lease been obtained, the operations of the miner are usually commenced by what is known as *shodding* or *costeaking*. This consists in sinking a series of pits from the surface to a short distance in the shelf or rock, in a direction as nearly as possible at right angles to the presumed run of the lodes in the locality. These pits, being connected with each other by means of galleries from their bottoms, will necessarily discover the backs of any veins or lodes that may be traversing the property.

When sufficient inducement for the further prosecution of the work has been discovered, the ground is either explored by an *adit-level*, or by shafts, crosscuts, and levels.

An **ADIT LEVEL** consists of a gallery driven in from the lowest available ground within the limits of the *sett*, and may be either directed on the course of one of the principal lodes, or so as to intersect the different veins at a more or less considerable angle. The first method, where practicable, possesses the advantage of exploring a considerable length of the vein, on the direction of which the level has been extended, and affords facilities for intersecting a number of parallel lodes by means of cross cuts, whilst, by the second, the whole of the veins contained in the *sett* may be frequently intersected.

A large amount of both money and time, are, however, often squandered in resorting to drainage by means of an *adit level*. Whatever facilities the locality may afford for this system of drainage, it is never prudent to resort to it if its cost will much exceed that required for the erection and maintenance of machinery to secure the same object. For this reason long shallow adits, a few fathoms only below the surface, are seldom to be recommended, since, to explore the ground to any considerable depth, machinery must generally be erected, and when this is done, the cost of raising water an additional ten or fifteen fathoms is but trifling. An *adit level* usually affords drainage to a very limited extent, and possesses few advantages beyond saving the cost of raising water from its point of intersection with the lode to the line of surface. When once this depth, and the quantity of water are known, the cost of the necessary machinery, and the expense of pumping can be approximately determined, and if these be compared with the expenditure incident to the driving of a level, the relative advantages of the two systems in both time and money become apparent.

SHAFTS.—When the employment of shafts has been determined on, it is of the greatest importance to the success of an undertaking to choose eligible sites for these works, since they not only constitute the highways to and from the various horizontal galleries, but also

afford the necessary facilities for unwatering the mine, and removing its produce. Where extensive permanent operations are contemplated, vertical shafts are generally to be preferred, especially when large lifts of pumps are to be placed in them, but in the case of commencing preliminary trials, it often becomes a question worthy of careful consideration, whether a saving of both time and money may not be effected by the use of underlie sinkings. Apart from ventilation and pumping, shafts are only used for winding and climbing, and for the latter purpose inclined are preferable to vertical shafts. The drawing of stuff through inclined shafts was formerly attended with considerable inconvenience and expense, since no efficient means had been adopted for the prevention of friction and strain. These evils have of late years been obviated by the introduction of a kind of guide rail from the mouth to the bottom of the shaft. This may be constructed either of wood or iron, whilst the kibble should be not only provided with wheels to run on the rails, but should also have anti-friction rollers, so arranged as to retain it in its proper position during its passage through the shaft. The form of the kibble employed should be such as to admit of its being readily filled and emptied. Where these appliances are adopted, the cost of drawing through underlie shafts is not found to exceed that of hauling through vertical ones, whilst in many instances the difference of the cost of sinking is exceedingly great.

LEVELS ON THE COURSES OF LODES.—Pryce, who wrote his "*Mineralogia Cornubiensis*," in the year 1778, states, that at that period the vertical distance between levels averaged about eight fathoms, but since that time it has been increased to ten, and, in some instances, twelve fathoms. There does not, however, appear to be any valid reason for adopting uniformity of distance between such drivages, since this should rather depend on the nature and character of the lode than on any arbitrary custom. When lodes are large and contain short lenticular bunches of ore, as in the case of many of the German mines, a less distance than ten fathoms may be advantageous, but in the case of veins presenting considerable uniformity of composition, distances of even fifteen fathoms might sometimes be adopted with advantage. The drivage of levels at short distances from each other must necessarily entail a heavy expense on an undertaking, and, consequently, this portion of mining cost should be carefully economised.

WINZES AND STOPES.—Winzes are shafts sunk between two levels for the purpose of connecting them, but without communicating with the surface, and are employed for forwarding ventilation, and many other purposes. When a shaft is sunk or a gallery excavated in hard rock, there is but little difficulty in making it retain its original form, but should the ground be soft, and consequently offer but little resistance to pressure, artificial means must be adopted for its support. This is most frequently effected by means of wood, although, in some instances, walls of brick or stone are employed for that purpose.

The ores existing in a vein are, to a certain extent, extracted in cutting the longitudinal galleries excavated in it, but, as these are situated at considerable distances from each other, the ore thus raised forms but a very inconsiderable part of the produce of the lode. In order, therefore, to obtain the minerals between the different levels, the ore is worked out and the space afterwards filled in with rubbish arising from the other operations of the mine. This operation is called *stopping*.

METHODS OF ATTACHING THE ROCK.—The tools employed by the miner necessarily vary in accordance with the nature of the rock which he has to traverse. If the ground be soft, nothing but an ordinary pick and shovel is employed; if it be somewhat hard, and contain numerous fissures, he has recourse to the use of steel wedges, called "*gads*," by driving which into the crevices of the rock he is enabled to split off larger portions than he could by the use of the pick alone. When

the ground to be cut through does not admit of being thus broken, the work is effected by the assistance of gunpowder.

Before this can be employed, it is necessary to bore a hole into the rock for its reception, which is done by means of a bar of steel, armed with cutting edges. Instead of using a steel bar, one of iron, furnished, at one of its extremities, with a steel point, is sometimes employed. To use this instrument, one of the workmen holds the sharpened end of the borer to the rock, whilst another hits the other end a heavy blow with a large hammer or a mallet. As the hole deepens, the person who holds the tool turns it a portion of a revolution between each blow, and in this way a deep hole is ultimately obtained. The borer is, from time to time, during the operation, removed from the hole for the purpose of taking away the broken rock or sludge, and a little water is added for the double purpose of cooling the borer and facilitating its action. When the hole has attained a sufficient depth, which necessarily varies with the nature of the rock operated on, it is carefully cleaned out with what is called a swab-stick, and a proper quantity of gunpowder deposited at the bottom. For the purpose of confining this, and thereby giving force to the explosion, the hole is now filled up by ramming in a quantity of soft schist called "tamping;" a small hole being left by the introduction of a copper needle, which is subsequently removed to afford means for exploding the charge when required. This is done by means of a reed or rush, filled with fine powder, and to which a slow match is attached, during the burning of which the men have time to escape out of the reach of the fragments of rock projected by the explosion. Within the last few years, however, this method of blasting has, in this country, become almost entirely superseded by the use of the "patent safety fuse," which itself not only acts as a slow match, but has also the advantage of being safer and more readily employed, since, with it, the copper needle is no longer necessary, the fuse being placed in the hole before it is closed, and the tamping forced in around it.

When the rock in which a hole has been bored is damp from infiltration of water, the powder is enclosed in a waterproof bag before being introduced into the cavity.

PUMPING MACHINERY.

From the large quantities of moisture constantly percolating through the strata, all the workings of a mine below the adit level would quickly become filled with water if some means were not adopted for its removal, and, for this purpose, numerous and frequently very complicated machinery has, at various periods, been made use of.

The most simple and earliest employed method of removing the water from a shaft, is doubtless by means of a bucket and cord set in motion by manual labour or horse-power although, on referring to the works of Agricola, who wrote about the year 1530, we find that pumps of various descriptions, set in motion by water-power, were then in very common use for mining purposes.

We are informed by Mr. Bald, in his "Coal trade of Scotland," published in 1812, that in 1890 water-wheels and chains of buckets were commonly employed to drain the collieries in that country. The axle of the wheel extended across the pit's mouth, and small carriers were fixed upon it to receive endless chains, consisting of two or three tiers which reached down to the coal. To these chains were attached wooden buckets or troughs fixed in a horizontal position, which circulated with the chains ascending on one side and descending on the other, filling at the bottom and discharging at the top, as they turned over the wheels of the axletree. This apparatus was subject to the inconvenience, that whenever a joint gave way, the whole set of chains fell to the bottom, and every bucket attached to them was splintered

in pieces by the fall. When water could not be procured, the same sort of machinery, upon a smaller scale, was worked by horses.

In 1708, windmills were erected to work pumps on several collieries in Scotland, but, being ineffective in calm weather, never came into general use. Savery, about the year 1696, was probably the first to employ steam-power for the raising of water to a higher level.

In Savery's engine, a vacuum was formed in the receiver by the condensation of steam; water was then forced into it by the pressure of the atmosphere, and elevated to any required height by the direct action of steam on its surface. This inventor was the first to employ the term horse-power. His apparatus was ultimately superseded by Newcomen's atmospheric engine, introduced about the year 1705. The construction of this machine differed widely from Savery's arrangement, inasmuch as the steam exerted no direct influence on the surface of the water to be elevated, but was only employed as a means of forming a partial vacuum beneath a piston attached to one end of a lever, whilst the pump rod was in connection with the other. In this, atmospheric air performed the principal duty, whilst steam was merely used as a means of removing the air from beneath the piston. To this engineer belongs the credit of introducing the beam or balance lever and the method of condensing steam, and forming a vacuum by immediate contact with cold water.

The various cocks and valves of this apparatus were at first opened and closed by the hand of an attendant, until Humphrey Potter ingeniously connected them with the beam by means of strings and catches. This arrangement was subsequently improved on by Mr. Henry Beighton, who employed the plug rod and hand-gear; which, with but slight modification, is that used at the present day. This gentleman was also the first to adopt the steelyard safety-valve.

Two of Newcomen's engines were, at an early period, erected at Wheal Busy, near Chacewater, with cylinders respectively 66 and 72 inches in diameter. The consumption of coals by these two machines amounted to 320 bushels, or about 13 tons daily.

In the year 1766, the attention of Smeaton was first directed to improvements in steam machinery. With an experimental engine of one-horse power, he evaporated 6½ lbs. of water by 1 lb. of coal, and produced the best effects with a pressure of 8 lbs. above that of the atmosphere. In 1775, he erected a 72-inch atmospheric engine at Wheal Busy. The stroke of this machine was 10½ feet, the cylinder being placed over the boiler, and the main-beam composed of several pieces of wood bolted together, and provided with D ends. The highest duty performed by this apparatus was 9,450,000. By enclosing the fire, and supplying the fuel through a tube, this engineer was able to evaporate 7.88 lbs. of water with 1 lb. of coal. Watt was chiefly occupied with his improvements of the steam engine from the year 1762 to 1800. He found that the loss of heat, arising from condensation within the cylinder, amounted to 32 per cent. of that employed, in addition to a considerable loss of time to effect the result.

His first attempt at improvement was to employ a wooden cylinder; but he ultimately arrived at the conclusion that, in order to obtain the greatest economic effect of steam, the cylinder should be of as high a temperature as the vapour entering it—that condensation should be effected in a separate vessel—and the injected water, if possible, cooled to below 100 deg. Fahr.

The means of accomplishing this did not occur to him until 1766, when he conceived the idea that, if a communication were opened between a cylinder containing steam and another vessel exhausted of air, the steam, as an expansive fluid, would immediately rush into the empty vessel, and continue to do so until an equilibrium was established; and that if the vessel were kept sufficiently cool, by injection of water or otherwise, more steam

	Newcomen's.	Watt's low-pressure (often expansive).	Watt's high-pressure expansive.
.....	77	63 double	90 single
.....	6 to 7½	6 to 9	3 to 18
.....	1,720 to 1,778	1,778 to 1,812	1,812 to 1,838
.....	3 to 7	12 to 9	20 to 93
.....		19½ in 1,793	about 50
.....		17½ in 1,798	
.....	90	200	293

In 1835, Messrs. Lean estimated the number of pumping engines in Cornwall at 104; stamping engines, 14; and winding engines, 66; making a total of 184. These annually consumed 69,559 tons of coal, of the total value of £39,125. The quantity of water delivered from the Cornish mines in 1837, was estimated by Sir Charles Lemon at 37,000,000 tons. The average cost of pumping water in the Cornish mines, from a mean depth of 100 fathoms, is about 1 3-10th penny per 1,000 gallons. This sum includes coal, engine men, and pitmen's wages and sundries, but does not comprehend any charge for wear and redemption of machinery.

DUTY OF THE STEAM-ENGINE.—The term duty was first employed by Watt to express the net result obtained from the combustion of a given quantity of coal. This expression may therefore be regarded as the result obtained by multiplying the weight of water lifted by the space through which it has been raised, and dividing by the weight of coal consumed— $\frac{(W \times S)}{C} = X$.

Messrs. Boulton and Watt appealed to this test of the efficiency of their engines, when engaged in determining the saving of fuel due to their inventions. Watt also invented the *counter*, for recording the number of strokes made by an engine; this was, as at the present time, attached to the main-beam. At the expiration of Watt's patent, about the year 1800, the duty of the best engine in operation was 20,000,000, which, compared with the best results rendered by Smeaton's engines, viz., 9,450,000, will show an increase of 100 per cent., and this may be taken as the economic value of the several improvements effected by this inventor.

The progressive duty of the steam-engine has been ably traced by Mr. Taylor, from the time of Smeaton down to the year 1823. The researches of this gentleman show that practical experience has done far more than scientific investigation towards attaining the present great economy of fuel; and that this result has been mainly effected by the use of high-pressure steam expansively employed, introducing Trevithick's boiler, and clothing the cylinder and steam-pipes with some non-conducting material.

The periodical increase of duty in Cornish steam-engines from 1813 to 1856 is given in the following table:—

Year.	Approximate No. of engines reported.	Average duty of the whole.	Average duty of the best Engine.
1813	24	19,456,000	26,400,000
1823	45	28,156,162	42,122,000
1833	57	46,142,466	83,306,000
1838	61	48,700,000	84,200,000
1843	36	60,000,000	96,100,000
1848	27	53,166,600	—
1856	24	47,000,000	—

Of late years the duty of the Cornish steam-engine appears to be slightly on the decrease, but this is in some measure due to the employment of fuel of an inferior description. In the year 1838, the Messrs. L.

the ground to be thus broken, the water is removed by gunpowder.

Before this can be done, a hole into the rock is made by means of a bar of steel instead of using a steel rod at its extremities, with a hammer or a mallet, who holds the tool between each blow, and the hole is gradually obtained. During the operation, a little water is added to the borer and finally has attained a surface with the nature of a fully cleaned out well. For the purpose of force to the explosion, ramming in a quantity of a small hole being a needle, which is set for exploding the rock by means of a rod to which a slow match of which the end of the fragment. Within the hole, blasting has, in fact, superseded by which itself has the advantage since, with it, the fuse being the tamping.

When the rock is from infiltration waterproofed.

From the colating the below the water it is and, for complicated use of.

The removing of a bucket horse-power Agricola, pumps of power, purposes.

We are Scotland, and the collieries extended fixed upon two or three these chains as other, fill as they apparatus over a joint bottom, a.



not often put up until after the value of the mine has been somewhat established.

In Cornwall the low-pressure engine is generally preferred, but in other localities small horizontal high-pressure engines are often employed. The machinery used in Cornwall for this purpose is more expensive than that employed in collieries, whilst the speed of the rope is not only less, but the weight at a draught is, on the whole, not so considerable. The monthly engine reports of Mr. Browne, show that for the year 1854, twelve engines raised 35,833 kibbles from a mean depth of 139 fathoms, and that the average duty of these machines amounted to about 15,500,000 lbs. raised one foot high by the combustion of 112 lbs. of coal. Most of the Cornish winding engines have been designed with a view to the utmost economy of fuel; but it is to be doubted if the engineer always succeeds in this way in effecting a real saving of expenditure, since it must be recollected that an economy of fuel, extending over a very long period, will be required to compensate for the difference of first cost and the resulting interest on outlay.

The difference of expense between hauling by steam and horse-power has been estimated at 50 per cent. in favour of the former; but this is certainly less than the true result, and in deep mines it would be found all but impossible to remove the stuff broken by horses alone. The annexed table affords some interesting particulars relative to drawing engines employed for mining purposes.

MECHANICAL PREPARATION OF ORES.

PICKING.—The ores which are extracted from the mine are not usually sufficiently rich in mineral to enable them to be smelted without being first subjected to sundry mechanical operations. As they are but sparingly diffused through the lode, and are mixed with large quantities of unproductive stone, a preliminary sorting takes place in the mine itself. The miner separates those fragments which do not appear to contain any portion of metallic matter from those which have a certain proportion of ore diffused through their substance; the former being allowed to remain in the mine, where they are employed for filling up certain portions of the excavations, whilst the latter are transported, by means of either barrows or waggons, to the shaft, and subsequently conveyed to the surface. They are now generally washed under a stream of water falling on a coarse grating or perforated iron plate, and divided into at least three classes, 1st, the gangue, or stony matter, which is rejected; 2nd, the rich ore, or best work, which, in the case of copper or lead ore, is frequently sent direct to market; and 3rd, the fragments, which, although containing but a small quantity of mineral, are, nevertheless, too valuable to be thrown away.

CRUSHING AND STAMPING.—Before the ores so prepared can be further concentrated, they must be first reduced to the proper degree of fineness, and are, for this purpose, subjected to the action either of a crushing or stamping mill.

The crushing mill consists of two strong iron rollers, set in motion either by steam or water-power, working in a framework of cast-iron, firmly secured by screw-bolts to heavy wooden bearers. The bearings of these rollers are so arranged as to slide in grooves, and consequently admit of the cylinders being either advanced or separated to a greater distance. To prevent accidents to the machine from the passage of large fragments of stone too hard to be broken, a certain degree of elasticity is given to the arrangement by means of levers, which by a sliding bar and shoulder constantly tend to keep the surfaces of the two grinding cylinders in contact, since the other extremity is loaded with an iron box containing heavy weights. The ore to be crushed is allowed to fall gradually between the two rollers through a hopper, the weight on the levers being so adjusted as to suit the degree of hardness of the mineral to be broken. On passing through

the rollers, the crushed ores fall into the upper extremity of an inclined cylinder of coarse wire gauze. This being

Name.	Character of Engine.	Diameter of Cylinder.	Length of Stroke.	Number of revolutions per minute.	Speed of Piston in feet per minute.	Pressure of steam on Piston per square inch.	Mean Diameter of Drums.	Speed of rope in Shaft per minute.	Weight of Load drawn.	Tons drawn per day of eight hours.	Depth of Pit or Shafts.	Diameter of drawing Pulley.	REMARKS.
South Sea Colliery.....	Vertical Spur gearing	12 in.	20 ft.	4 6	60	450	10	9 1/2 to 10	20	260	130 & 165	7 ft.	
British Iron Works	Horizontal direct link motion.	24	4 6	35 to 50	315 to 450	50	11 & 11 1/2	1400	20	400	160	8	
Bryn Malley Colliery.....	"	26	5 0	40 to 50	400 to 500	45	9 & 11 1/2	1130 to 1440	20	400	140 & 210	7	
Miners Lead Mine, No. 1.	" Spur gear	14 1/2	3 0	50	300	14	5	350	25	100	120 150 170	7	
" " No. 2.	"	14 1/2	3 0	50	300	15	4 1/2	250	25	100	100	4 1/2	300 Tons if from 2 Pits.
Average of Mines of Cornwall.....	Vertical condensing	22	5 0	15 to 20	150 to 200	12	4 1/2	150	10	...	Variable	5	

set in motion by the same machinery as the rollers

selves, divides the pulverised ore into two classes, the one passing through the meshes of the trellis, and falling into a suitable receptacle placed beneath it for that purpose, whilst the other, which is too large to pass through the apertures, is carried to the lower end of the cylinder, where it falls into the buckets of a kind of inverted water-wheel, by which it is again carried to the level of the rollers for the purpose of being re-crushed. The average expense of crushing copper ores by water-power may be taken at 2½d. per ton.

The poorer varieties of ores, and especially those of tin, instead of being crushed by rollers as above described, are pounded into small fragments by means of heavy pestles, set in motion either by water or steam power. The machinery by which this is effected is called a stamping mill, and is provided with a large horizontal axle, furnished with a series of cams arranged in spirals around it. Vertical wooden or iron beams are so attached to large masses of cast-iron, that, when raised by the cams fitted into the axle and corresponding tongues in the lifters, they fall on the mineral beneath them, and thus, by repeated blows, reduce it to a fine powder. The cams are so arranged in the spirals that each lifter shall give three blows during a revolution, and as soon as the first lifter has been released from the cam and begins to fall, the second cam in the series comes in contact with the tongue of the next lifter, and so on until each has in succession struck a blow, when the first lifter is again caught by the first cam belonging to the second system on the axle, when another series of blows is dealt by the several pestles. The lower portion of this arrangement is enclosed in a strong wooden trough or "cofer," in which are openings, into which are fitted gratings made by punching holes into thin pieces of sheet iron. By means of a launder a small stream of water is made to flow continuously into the cofer, and therefore whenever fragments are sufficiently reduced in size to allow them to pass through the gratings, they are carried off by the water into pits in which they are deposited by subsidence. The weight of the pestles usually varies from three to four hundred pounds each, and the number of blows per minute given by each lifter may be from fifty to seventy. The bottom of the cofer is either formed of a large block of cast iron, or of a consolidated mass of hard vein stone, which has become solidified by the constant action of the pestles. The latter arrangement is more commonly employed in this country, but cast-iron beds are much used all over the continent of Europe.

The expense of stamping in this country by steam power, one ton of ordinary stuff, sufficiently fine to admit of the separation of the tin which it contains, may be taken at 1s. 8d., and in some instances tin stuff, containing only about 15 lbs. of merchantable tin in the ton, has been raised and dressed with considerable advantage. Tin ores are usually dressed to a produce of about 70 per cent.; lead ore from 50 to 75 per cent. Copper ores when broken from the vein in Cornwall may be estimated to give an average produce of less than 2 per cent., and are commonly concentrated by mechanical preparation to about 6½ per cent.

DRESSING.—The principles on which is based the concentration of metalliferous ores are exceedingly simple, but the arrangements employed for this purpose are very varied, and are modified in accordance with the nature of the minerals to be operated on. If a number of particles, varying in form, size, and density, be held in suspension in a current of water, or allowed to fall through that medium, they will arrange themselves in accordance with the resistance they experience from that liquid. If their form and size be the same, but they vary in density, they will arrange themselves in the order of their respective specific gravities, the lightest forming the upper, and the heaviest the lower strata, of the series. If, on the contrary, their form and density be the same, but the size different, the larger fragments moving more rapidly than the others, will

the deposit. This arises from the circumstance that although their volumes increase as the product of their three dimensions, the resistance offered by the fluid increases only as the product of two of those dimensions, and therefore the resistance in the case of the larger fragments is proportionately less. If the granules have the same volume and density, but differ in form, those which expose the least amount of surface will fall most rapidly through the water, and form the lowest layer.

It is therefore evident that the particles of ore to be dressed should be reduced, as nearly as possible, to the same dimensions, in order that they may the more freely subside in accordance with the order of their several specific gravities. Each of the fragments operated on must evidently belong to one of the three following classes:—

The first class will consist of the mineral sought, without any admixture of earthy matter. The second will comprehend the fragments which are made up of a mixture of ore and earthy substances; whilst the third will be composed entirely of earthy matter, without any admixture of ore. By a perfectly successful washing, these three classes would be entirely separated from each other, but in practice this degree of perfection can never be wholly obtained, although the results very closely approximate to the theoretical deductions.

The coarser fragments of ore, which have passed through the crusher, are generally concentrated by jigging, whilst the finer, and those that have been reduced by the stamping-mill, are enriched by washing in currents of water, varying in their force according to the nature of the ore and the minuteness of its state of division.

The methods employed for washing the reduced ores differ not only with the nature of the minerals, but also according to the locality in which the mines may be situated, and I shall therefore confine my observations on this subject to a description of some apparatus which we have recently erected, for the washing of lead ores, at a mine producing large quantities of argentiferous galena, associated with carbonate of iron. I would, however, remark that the chief distinction between ancient and modern ore-dressing consists in the circumstances that, whilst in the former the mineral to be treated was subjected, at intermittent periods, to numerous successive operations, it is in the latter so manipulated that the particles are never allowed to deposit themselves, but the operations are continuously carried on until clean ore is obtained on the one hand, whilst the waste is separated on the other.

The ores, on passing through the rolls, fall into a circular sifter which separates the finer particles from the coarser, these being returned by the raff wheel to be again crushed by the rollers. The ore which has been thus sufficiently reduced in size, and has passed through the rotating sieve, is carried by a stream of water into a second rotating apparatus, formed of perforated sheet iron, by means of which the sand and slimes are removed and washed into the buckets of a small water-wheel, whilst the coarser particles escape by the open end of the cylinder, and are removed to the jigging machines to be further cleansed and separated. The finer particles of ore, and the current of water in which they are suspended on falling into the buckets of the wheel, cause it slowly to revolve, and during its revolution time is allowed for the minerals to settle, in accordance with the size and densities of the particles. The result obtained is, that the heavier sands fall to the bottom of the buckets, whilst the lighter slimes are poured out of the wheel and carried off through suitable launders to the slime pit. The sands remaining in the bottom of the buckets are washed out by means of jets of water obtained by a pressure of about 15 feet in height, admitted behind the centre, and are thus carried off to round boddies, where their concentration is further effected. The tails of these boddies are thrown away, as being of no value; the middles are rebuddled in the same machine; and the heads, after being subjected to washing in a head buddle, are passed to the dolly-tab, and from thence carried

successful. The late Sir Charles Lemon had offered the munificent sum of £10,000 towards the establishment of mining schools in the heart of the mining districts, but it was not responded to by the persons in those districts most interested in the matter. Other attempts to establish schools had been made, but he feared they were languishing for want of proper support. If the mine owners of the country were properly alive to their own interests, they would certainly forward these schools in every way in their power; for, it was well known that, in every description of industrial pursuit, the intelligent workman was always the best workman. He contended that persons destined for mining pursuits ought to receive elementary instruction in chemistry, mineralogy, and geology, which would make them more fitted for their occupation than if they simply relied upon the practical knowledge they might gain by experience. He was astonished to find the difference in point of education between the miners of England and those in many parts of the Continent. He had made inquiries of working miners on the Continent as to the nature of the material they were at work upon, and those inquiries had been answered in a way that he had failed to meet with even from mining captains in England. In point, however, of perseverance and industry, he would place the English miner as high as any of his class in the world. With reference to mining speculation, he was frequently in the habit of meeting persons who asked his advice as to how they were to act in matters of this kind, they having been induced to invest their money, solely from hearing of the enormous profits made in other quarters, and having met with bitter disappointment.

Mr. NIXON said, with reference to blasting, that he did not see any practical advantage to be derived from an enlarged aperture at the end of the bore, inasmuch as under the plan generally in use, the cavity was sufficiently large to admit of the necessary quantity of powder being placed in it. Such a plan as that suggested, he thought, would be more applicable to open quarries than to underground operations. The author of the paper had pointed out, in a very lucid manner, the advantages of properly-arranged machinery in the economical working of mines, as well as the improvements which had been introduced during the last 50 or 60 years. Within his own recollection the crushing mill was first introduced into the west of England, and consisted of rollers of 12 inches diameter worked by a water-wheel with a small sieve placed underneath them to receive the crushed material. The ore on passing through the sieve was taken away in barrows, and washed after the most simple fashion. Previous to that the ore was broken up by women, the operation being called "bucking," but the introduction of the roller-crushing machine was considered a great improvement. In the machine, the drawing of which was exhibited, the contrivances were very admirable, and the object of economy in working appeared to be fully attained. The round buddle exhibited was also a great improvement upon the old plan of "buddling," and was likely to be very useful. With regard to the value of mining property generally, he did not go to the extent of Professor Tennant in considering it an undesirable investment. His own experience through life had been that mining adventures, entered into with judgment and carried on with honesty, were a satisfactory mode of employing capital. He contended that mining operations ought to be carried on upon the system of underwriting. It capitalists were guided solely by the prices quoted in the market, and by the representations of interested parties, the probability was that they would, in the end, find themselves considerable losers by their speculation. At the same time, he thought it was not proper to charge upon legitimate mining adventures the result which had followed a reckless system of gambling in such matters.

Mr. THOMAS SCOTT considered it essential that education in the elementary sciences connected with mining should be imparted to those who were engaged in that

pursuit, in which respect he believed they were very deficient at the present time. In his intercourse with mining captains in England and in Ireland, but more especially in the latter, he found that such professional education as they had acquired had been for the most part matter of chance. Allusion had been made to the unsuccessful attempts to establish schools of mining in the mining districts. The result was, that they had an illiterate class of workmen, and an educated miner was the exception to the general rule. With regard to the profitable nature or otherwise of investments in mining, it was to be remarked that in too many cases adventures were got up for speculative purposes. A company was formed and shares were issued; the promoters always taking care to reserve a large slice to themselves. Calls were made, a captain was engaged, and operations were commenced. It was pretty well known that engineers were not wanting who could furnish glowing reports of the supposed capabilities of a mine. Call after call having been made upon the shares, it would become necessary that there should be some show for the money, and in such case it might be, that, yielding to the pressure from without, the captain would "pick out the eye of the mine," as it was called; or, in other words, not work the lode in a legitimate manner, but only for the purpose of sending some amount of ore into the market. That being done, an outcry was got up as to the yield of the mine, and, thereupon, fresh shares would be issued, and further calls made upon the hapless shareholders, and in that way enormous sums of money had been lost. He submitted that, whilst it was desirable to have the workmen better educated, they also wanted honesty on the part of those who managed these undertakings.

Mr. PHILLIPS fully subscribed to the view expressed that to improve the education of miners in England would be to improve their position in life. In reply to what had fallen from Professor Tennant, with regard to the superior education of the miners on the Continent, by (Mr. Phillips) would put in a plea for the English miner. He had had the management of one of the largest mines in Westphalia, in which between 300 and 400 German miners were employed; but when a shaft had to be sunk in hard ground, the German workmen were unable to do it, and the work was contracted for by English miners at a less price than it could be done for by native workmen, although the German miners earned only 50s. per month, and the English miners £8 per month. It was true that the Germans were better educated as to reading and writing than the English miners, but they had very little knowledge of mining, which arose from the fact that at one time the Germans would be occupied in farming, at another time in smelting, and when they had any money they would do nothing at all. The English miner was for the most part attached to his calling, and owing to the tribute system, which had obtained almost from time immemorial, it was to his interest to acquire such knowledge of his business as to know where to get a "pitch" to earn a good living for himself; and when once a family engaged in mining, they remained miners for many generations.

Mr. NIXON would mention, in illustration of the benefits resulting from a practical education, that he had known cases in which persons had taken a "pitch" at a higher price than was offered by others, simply from their knowledge of the quality of the material they were going to work upon. It could not be said that the Cornish miners were ignorant men.

Mr. HYDE CLARK differed from Mr. Phillips in the relative intelligence of the English and the Continent miners. The facts and statistics in the progress of English mining in this country were owing to improvements effected by the education of the mining class. Under these circumstances, it could not be conceded that the position of the English miner was so bad as had been assumed by the

mining education, neither was it to be assumed that the attempts were failures, or that they ought to be abandoned, still less that their want of progress was the fault of the mining interests, when it might be the fault of the system adopted. It had been urged that Sir Charles Lemon's scheme failed, and the mining schools languished, because the mining interests did not contribute the same required for their support. Now, whom did they call upon to contribute? First, the lord or landlord, few of whom received large incomes, and many very small dues; next, the mining shareholder, who had only a leasehold interest in what had been defined as an uncertain speculation; and thirdly, the working captain and miner, with very small earnings. Under the circumstances, these were the last persons who could be expected to contribute; but, as mining undertakings, however uncertain to those engaged in them, undoubtedly added largely to the resources of the country, so it was for the interest of the community to support the whole expense of mining education, and to give free instruction to the working miner. However small the fees were, they were a heavy tax on the working captain or miner, who had to make that was a great sacrifice to him, the sacrifice of his working time for the purposes of study, and though he would undoubtedly reap a good return from his improved knowledge, the community would no less benefit. So far from the miner being called upon to contribute or make sacrifice, he should be encouraged, in every way, by bursarships and scholarships, freely given, to attend the schools, more particularly in the beginning, when he was not prepared by experience to appreciate what he considered as merely theoretical knowledge.

Professor TENNANT wished to add that an attempt was made, in 1804, to establish a school of mining, and a large sum was subscribed under the auspices of Sir John St. Aubyn, in order to establish a School of Mines at the Royal Institution in Albemarle-street. A sufficient sum was at first forthcoming, and the subscriptions were returned. He believed a sum of upwards of £4,000 was subscribed. He hoped to see that system carried out upon an extended scale, which would result in the miners being better educated, and, therefore, superior workmen.

The CHAIRMAN said it now became his duty to propose a vote of thanks to Mr. Phillips for his able and interesting paper, and in so doing he desired to be permitted to offer a few remarks. The paper with which they had been favoured comprised a very comprehensive knowledge of the history of mining, and an able description of many of the processes employed in that branch of mineral industry. It showed what must be considered a very advanced state of mining in this country, as compared with what it was half a century ago. With reference to the remarks of Mr. C. H. Smith, upon the subject of boring holes for blasting purposes, and the idea he had suggested of an enlarged cavity at the end of the mine, he (the Chairman) did not think that, for mining purposes in general, any practical advantages would be derived from carrying out that plan. In the operations of blasting, as at present carried on, the results were almost universally such as the miner desired to effect; the methods used were generally suited to the circumstances of the mine; the operation was conducted with great rapidity, and had the effect, in most cases, of detaching the quantity of rock that was required to be displaced. Knowing as he did the great ingenuity and talent of Mr. C. H. Smith in all that was connected with the cutting of even the hardest rock, and his extensive knowledge of the quarries throughout the kingdom, there was no one to whose suggestions he would bestow greater attention. Mr. Phillips had referred to the extreme fluctuation which was going on in mining, and this had given rise to observations which really only ended in this—that mining, like

that it gave rise to a great deal of what he might call unwise speculation, resulting, in many cases, in a vast amount of disappointment to the parties who had entered into it. One of the first things to be done, before they could have mining in this country brought to perfection, was to make all those who entered into mining operations tolerably well acquainted with what they were going into. It was all very well to say, that if people only entered into judicious speculations, they would succeed. The difficulty was to ascertain what was a judicious speculation. He had known persons who had invested large sums of money in mining adventures without the least idea of the nature of the mines, the position of veins, the character of the works, or any other conditions of the undertaking. They took shares merely because they heard that other persons had made a great deal of money by such speculations; and, in his own experience, he could confirm the statement of Professor Tennant, as to the many expressions of bitter disappointment that came from persons who had fallen victims to unsuccessful mining adventures, and who, in the recital of their melancholy history, proved that they had been most sadly and egregiously taken in. He was glad to find that Mr. Phillips, in his paper, had referred to, and taken some extracts from, the curious old literature and charter, which were in existence in relation to mining. These would be found highly interesting to those occupied in mining pursuits, inasmuch as there was a quaintness and force about the writings of those ancient authors which were useful and suggestive and withal picturesque. Another point of interest in the paper was the subject of the returns made to the Mining Record Office, in Jermyn-street. Those returns were regularly published, and from that source Mr. Phillips had gathered some of the valuable statistics given in the paper. He (the Chairman) felt the more interest in the success of that establishment inasmuch as twenty years ago it was at his office, in Newcastle-upon-Tyne, that a committee first met for the purpose of urging upon the Government the great importance of such records of mining being kept. The result of the memorial then drawn up by that committee was that a small fund was devoted to the desired purpose; this had since been increased, until, at the present time, the Mining Record Office, under the able management of Mr. Robert Hunt, had been brought to a state of great proficiency and usefulness. He thought nothing of that description could be more valuable than the statistics which Mr. Hunt had collected, and which were published every year. He believed in the present year those records would embrace the particulars of stone quarries, as well as those of coal and other mineral products, so that a more accurate view of British mining would now be afforded than the public had ever before had an opportunity of obtaining. Mr. Phillips had also referred to the extreme fluctuation of prices. That was a subject very intimately connected with the progress of mining, and one which was apparently out of the reach of all calculation. So long as an uncertainty of price hung over mineral produce, it was impossible that miners could make their calculations with that degree of certainty which was desirable as a basis for long prospective operations. The advantage of machinery, as compared with the system of levels, had been well pointed out by Mr. Phillips, and he fully agreed with him in thinking that wherever mining operations on a large scale were undertaken, a proper arrangement of the shafts and engines was to be preferred to what was formerly thought to be the more economical method of driving what miners called "day levels." Reference had been made to the School of Mines, in connection with the Museum of Practical Geology in Jermyn-street. That Museum was almost entirely got up through the persevering energy of the late Sir Henry de la Beche, and was at the present time most ably and liberally conducted

tions. Lectures were also frequently given to large numbers of such of the working classes as chose to avail themselves of so valuable an opportunity. Mr. Phillips had mentioned a great name connected with engineering and mining—that of Smeaton—some of whose works, in connection with mining in the north of England, were of great extent and importance, and had led to many valuable improvements. The impress of his mind had been given to the character of mining works, and this had an important practical bearing upon the further improvement of such operations. In connection with the water-engine made by Mr. Westgarth, he might mention that he had in his possession a letter written by Smeaton, in which he strongly recommended Mr. Westgarth to the attention of the Society of Arts as a most ingenious and deserving man, showing the estimation in which this Society was held by so eminent a man as Smeaton. The subject of mining altogether was one of much greater importance than it was generally considered to be; for, if they looked at the position they would be in in the absence of coal, they would see that the due consideration and prudent use of it, and indeed of all minerals, as well as the safe and economical working of them, were subjects of the greatest importance. With respect to the quantity of coal yet remaining in this country great variety of opinion had prevailed. He, himself, was not so sanguine as some as to the long duration of the means of profitably working coal in this country, but whatever would tend to the economical development of the mineral resources of those industries which were at the very foundation of all our manufacturing greatness, was of the highest importance in a national point of view. He was sure the meeting would heartily concur in a vote of thanks to Mr. Phillips, for the interesting and instructive communication which he had laid before them.

A vote of thanks was passed to Mr. Phillips.

The Secretary announced that on Wednesday evening next, May 5th, a Paper by Mr. Charles Sanderson, on "Iron: its Commerce, and Application to Staple Manufactures," would be read.

SOUTH KENSINGTON MUSEUM.

During the week ending 24th April, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 5,221; on Monday and Tuesday (free evenings), 4,842. On the three Students' days (admission to the public 6d.), 1,332; one Students' evening, Wednesday, 188. Total, 11,643.

Home Correspondence.

THE SMOKE NUISANCE.

SIR,—Smokeless combustion has been long enough an interesting and important subject, both under a sanitary and commercial view, to render no apology necessary for a few lines, in which I would venture to lay before the large body of coal burners by whom your papers are read, a very successful method of reducing the production of smoke to a minimum in coal fire.

The advantage of obtaining this result in the manner described, is enhanced by the fact that it is attended with the greatest economy, the fuel burnt being of the cheapest kind, and one which has become of late rather heavy on the market, on account of the increased consumption of Welsh coal.

It is simplicity itself, and is as follows:—furnace to be of the ordinary construction and same purposes, and that the fire is already level, and clean, and the bars well covered, country slack (value about nine shillings

per ton, delivered), one and a-half hundred weight, set it with one bucket full of water, and following up the shovels full in rapid succession, put the whole on one part of the fire; the place is immaterial—front, side, middle, or back—but cover less than half of it, and take care especially of one point, on which the whole depends, viz., that the heap has a black top, and that it is thick enough for no gases to burst through it.

Before the fresh coal has been on this fire many minutes, a rapid discharge of gases will take place from the under side of the fresh coal, which, passing on through the live coal, will burn with an intense flame all round the edges of the heap. The fresh coal will thus part with all the smoke-producing gases, and become thoroughly caked; until this is the case do not touch it, nor even then unless there is a necessity.

Should other parts of the fire burn into holes while this is going on, fed with coke, but no harm will arise should the heap burn ever so hollow.

When the coal is consumed repeat the process, which may be carried on conveniently on both sides of the furnace simultaneously or alternately.

The idea of coking the coal on its own fire is so novel, but the essential necessity of keeping a black top has never been insisted on, and, consequently, the plan of firing on part only of the fires may fail or succeed according as that point has been attended to.

I have tried this system for some time, with a consumption of ten tons per diem, and have burnt many hundred tons of slack; the quantity of coke used, on account of my chimney being one of the most noticeable in London, having been about one-third of the whole consumption.

I have little doubt that, in many places, with the exception of the time when fresh fires are lighted, the furnaces might be entirely fed with small coal, which is, for this purpose, far preferable to that of rough size.

Small coal as purchasable at the London wharves has an efficiency, when thus burnt, only three or four per cent. by weight below the best gas coke, value 18s. per ton.

The method described is the perfect opposite of the time-honoured practice of thin and level firing; and, in Cornish boilers, my own practice of firing, with slack on both sides, brings the section of the fire to the form of a crescent.

To impress the essential point, I have called this system "black-top firing."

I am, &c.,

CHARLES GREAR.

London, April 24, 1858.

Proceedings of Institutions.

ROYSTON.—At the Institute, on Monday and Tuesday, 12th and 13th inst., Dr. J. C. Daniel delivered the first two of his course of four lectures on the "Four States of Matter." The subjects were—James the First and Charles the First, their private lives and characters.

SALFORD.—The fourth annual report of the Mechanics' Institution states that the success of the Institution, in its educational departments, was never more marked, and that the numbers attending the classes are considerably above those in the preceding year. A greater proportion than heretofore of the members has been of the adult class. The directors tender their thanks to Messrs. Mather and Platt, Oddy Thompson and Co., and Mr. Guest, for the support they have rendered the Institution, by purchasing and presenting tickets of membership to their workmen, and they earnestly recommend other firms to follow so desirable an example. The directors also thank several other gentlemen for liberal donations to the funds of the Institution. Day schools for boys and girls are connected

with the Institution, and the welfare of these schools as continued to engage a large share of the attention of the directors, who have devoted the Lecture-room of the institution for the boys' day-school, and have converted the Reading-room and a room adjoining into the girls' day-school, thereby effecting a very desirable improvement in the school-accommodation of the Institution. The evening classes have been well attended, and are conducted in an efficient manner. The subjects taught are:—Reading and writing; arithmetic and grammar; book-keeping; mathematics; algebra; mechanical and architectural drawing; French, and German. There has been a marked increase in the numbers attending the majority of these classes for the quarter ending Christmas 1857. The classes for book-keeping and algebra have been opened during the year. The first public examination of the members attending the classes of the various Institutions in connection with the Institutional Association of Lancashire and Cheshire took place in September last, at the Manchester Athenaeum, but, in consequence of the limited notice given by the Council to the Association prior to the examination, only four of the members of this Institution were able to become candidates. Three out of the four competitors, however, obtained certificates and prizes. Several donations have been made to the library, and the books have had a large circulation—the class of works most in demand being those of a standard character. The whole number circulated during the year is 2,200.

MEETINGS FOR THE ENSUING WEEK.

- Mon.** Royal Inst., 2. General Monthly Meeting.
 Entomological, 8.
 Architects, 8. Anniversary.
 United Service Inst., 8. Mr. J. Bourne, "On the International Communications of India."
Tues. Royal Inst., 3. Mr. J. P. Lacaita, "On the History of Italy during the Middle Ages."
 Civil Engineers, 8. I. Discussion on Mr. Hood's Paper "On Railway Stations." II. General Tremmense, "On the Public Works of the Bengal Presidency."
 Pathological, 8.
 Photographic, 8.
Wed. United Service Inst., 3. Colonel Wifford, "On the Coast Defences of England."
 Royal Soc. Lit., 4.
 Society of Arts, 8. Mr. Chas. Sanderson, "On Iron; its Commerce and Application to Staple Manufactures."
Thurs. Zoological, 3.
 Royal Society Club, 6.
 Antiquaries, 8.
 Chemical, 8. Dr. Odling, "On Atoms and Equivalents." Adjourned Discussion.
 Linnean, 8. I. Mr. Masters, "On a new species of *Bellis* from Mount Ida." II. Mr. Mitten, "On Indian Musc." III. Dr. Mueller, "Contributions ad *Acaciarum Australis cognationem*."
 Philological, 8.
 Royal, 8.
Friday. United Service Inst., 3. Major Griffiths, "On Field Fortification."
 Archaeological Inst., 4.
 Royal Inst., 8. Mr. J. P. Lacaita, "On the late Earthquakes in Southern Italy."
Saturday. Royal Inst., 3. Dr. Leakester, "On the Vegetable Kingdom in its relations to the life of man."
 Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Vol. No.**
Delivered on 15th April, 1858.
 58. Army Estimates—Proposed Alterations.
 59. Ballion—Return.
 60. Bill—Chelsea Hospital and Waterworks Exchange of Land.
 East India (Despatch of Troops)—Further Papers.
 Australia (Exploring Expedition)—Papers.
Delivered on 16th April, 1858.
 61. Army—Return.
 62. Spirits—Returns.
 63. Trinity College (Dublin)—Return.

194. Sardinian Medals—Paper.
 45. Bill—Malacott Forest (Alienation of Commons).
 Cape of Good Hope (Kaffir Tribes)—Further Papers.
Delivered 17th and 18th April, 1858.
 190. East India (Education in Behar)—Copy of a Letter.
 176. Corn—Return.
 178. Army (Regimental Establishments)—Return.
 181. East India (North West Provinces)—Return.
 184. Ship "Ganges," &c.—Return.
 193. National Debt—Account.
 197. Manhood Suffrage, &c. (Victoria)—Copy of an Act.
 200. Committee of Selection—6th Report.
 113. Harbour, &c., Bills (16. Mersey Docks and Harbour (New Works, &c.)—Board of Trade Report.
 118. Local Acts (24. Trent Navigation; 25. Andover Canal Railway; 26. Tramway Embankment; 27. Clyde Navigation; 28. Victoria Station and Pimlico Railway; 29. Whitehaven Junction Railway; 30. Middlesborough Improvement; 31. Tees Conservancy)—Admiralty Reports.
 44. Bill—Juries (Ireland).
 46. —Chancery Amendment.
 47. —Chelsea Hospital (Purchase of Lands).
 48. —Fortunna Bridge (Ireland)—(As amended by the Select Committee).
 East Indies (Mutinies)—Supplement to Papers (No. 6).
 Session (Second), 1857.
 310. Sessional Printed Papers—Numerical List and Index.
 310 (1). Seasonal Printed Papers—Titles and Contents.
Delivered on 20th April, 1858.
 164. Game Laws—Abstract of Returns.
 201 (1). East India (Revenues, &c.)—Return relating to Writerships.
 201 (2). East India (Revenues, &c.)—Return relating to Proprietors of East India Stock.
 203. Army (Civil Administration)—Return.
 Passports—Correspondence.
 Customs—2nd Report of Commissioners.
Delivered on 21st April, 1858.
 198. Dunfarnghy Union—Correspondence, &c.
 199. Coals (Aldershot)—Return.
 204. Reformatory Schools—Return.
 209. Enlistment of Krewmen—Return.
 213. Police Certificates—Return.
 113. Harbour, &c., Bills (27. Middlesborough Improvement)—Board of Trade Report.
 33. Bill—Cruelty to Animals Act Amendment.
Delivered on 22nd April, 1858.
 206. Revised Army Estimates.
 207. Army (Officers allowed half-pay with Civil Situations)—Return.
 214. Barracks—Return.
 216. Railway and Canal Bills—2nd Report from General Committee.
Delivered on 23rd April, 1858.
 195. Sandhurst Royal Military Academy—Return.
 202. Prince Edward Island—Papers.
 210. Army (Bursas paid to Relatives of Deceased Officers)—Statement.
 113. Harbour, &c., Bills (28. Wallasey Improvement)—Board of Trade Report.
 49. Bills—Poor Law Amendment.
 51. —Registration of County Voters (Scotland).
 53. —Customs Duties (No. 2).
 The "Cagliari" (Fac-simile of the Draft of Sir J. Hudson's Letter)—Further Paper.
 The "Cagliari" (Opinions of the Law Officers of the Crown)—Further Correspondence.
 East Indies (Mutinies)—Further Papers (No. 7).
Delivered on 24th and 25th April, 1858.
 64. Order of the Bath—Returns.
 65 (3). Trade and Navigation—Accounts (31st March, 1858).
 201 (3). East India (Revenues, &c.)—Accounts of Imports and Exports.
 201 (4). East India (Revenues, &c.)—Statement of Tariff on Duties.
 201 (5). East India (Revenues, &c.)—Statement of Territories, &c.
 201 (6). East India (Revenues, &c.)—Statement of the Number of Natives employed in the Civil Administration.
 201 (7). East India—Statement of Lines of Railway, &c.
 117. Railway and Canal Bills (96. Limerick and Foynes Railway)—Board of Trade Report.
 211. Foot Guards—Return.
 215. Bands—Return.
 218. Education—Returns.
 220. Patriotic Fund—Correspondence.
 40. Bills—Roads, &c. (Scotland).
 52. —Excise Duties.
 56. —Property Qualification.
 50. —Reformatory Schools (Ireland).
 57. —Registration of Partnerships.
 60. —Franchise Prisons.
 61. —Durham County Palatine Jurisdiction.
Delivered on 27th April, 1858.
 179. East India (Public Debt)—Return.
 222. General Board of Health (Orders in Council)—Returns.
 223. Board of Health (Expenses of Printing, &c.)—Returns.
 227. Seamen's Savings Bank—Account.
 201. East India (Revenues, &c.)—Returns relating to the Armies of India, &c.
 132. Railway Acts—Return.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, April 23, 1858.]

Dated 16th February, 1858.

294. J. Court, Willington-ledge, Willington, Newcastle-on-Tyne—An improved paint, pigment, or composition, more particularly adapted for coating the hulls of ships, either iron or wooden, so as to prevent damp, corrosion, or fouling, and apparatus for drying and warming surfaces, and preparing and applying to the same such paint, pigment, or composition.

Dated 24th March, 1854.

617. C. Kottula, Liverpool—Imp. in purifying soda leys, whereby they are rendered capable of expurifying all fatty matters or resins used in the manufacture of soap.

618. C. Kottula, Liverpool—Imp. in the manufacture of compact neutral soap.

Dated 3rd April, 1858.

164. A. Pelez, 9, Mortimer street, Cavendish-square—A new apparatus for deepening rivers and rendering them navigable. (A com.)

714. E. Edwards, Birmingham—An imp. or imp. in the manufacture of glass finger plates for doors and other articles of like manufacture.

Dated 6th April, 1858.

120. W. H. Clark, Atlas Works, Upper Park-place, Dorset-square—Imp. in grain and grass harvesting machines, and in the automatic delivery thereof of cut grain. (A com.)

122. J. Smith, Oldham—Imp. in the manufacture of pile fabrics.

724. S. Fox, Stockbridge Works, Deepcar, and J. Chatterman, Sheffield—Imp. in stays or corsets, and in the manufacture of steel employed therein, and applicable to other articles of dress.

Dated 6th April, 1858.

724. L. T. Van Elven, Clapham-road—Imp. in apparatuses for raising and lowering weights and bodies.

726. H. Weatherill and G. Gray, Upper Chapman-street—An apparatus for preventing down draughts and currents in chimneys, flues, and shafts.

730. J. Camp, John street, Tysoe-street, Clerkenwell—An improved construction of expanding portfolio.

722. C. H. Chadburn, Liverpool—Imp. in pressure gauges.

734. J. Eickmann, Rue Faubourg St. Honoré, Paris—Imp. in galvanic batteries.

736. D. Blanché, Bordeaux, France—Using Malacca and Mailla case instead of whalebone.

739. J. Rose, Glasgow—Apparatus for applying heat, cold, moisture, fumes, vapours, and other agents in medicine and surgery. (A com.)

Dated 7th April, 1858.

741. A. Camartelli and L. Camartelli, Liverpool—Imp. in pressure and vacuum gauges.

743. W. A. Glibbe, 4, South-street, Finsbury—An improved machine for corking bottles. (A com.)

744. J. Wright, 10, Alfred-place, Newington-caneway, Southwark—Imp. in the mode of treating leather in order to render it waterproof. (A com.)

746. W. Arncliffe, Farnly Iron Works, and H. Lea, Farnly, near Leeds—Certain imp. in the manufacture of iron.

746. R. Worthy, Albert-street, Regent's-park—An apparatus for preparing medical fomentations.

747. G. W. Baker, Park Farm, Woburn—Improved signal apparatus to be applied to railways.

748. W. Nimmo, Manchester—Imp. in the manufacture of printed woven fabrics.

750. John Doherty, Edinburgh—Imp. in buttons or dress fastenings.

761. C. F. Whitworth, Sheffield—Imp. in signal apparatus for railways.

Dated 8th April, 1858.

764. J. Cartwright, Shrewsbury—Improved apparatus for transmitting motive power for driving machinery.

765. G. Davies, 1, Berle-street, Lincoln's-lin—Imp. in the manufacture of wads for ordnance. (A com.)

756. G. F. Taylor, Gt. Leeds—Imp. in machinery for raising the pile of cloths.

757. G. Rowland, Brussels—Imp. in the manufacture of artificial whalebone.

758. F. W. Mowbray, Bradford, and J. Broadley, Saltaire—Imp. in means or apparatus employed in weaving.

759. W. Clark, 63, Chancery-lane—A burner for candles. (A com.)

760. T. Greenwood, J. Butley, and J. Doekey, Leeds—Imp. in machinery for carding, opening, straightening, and preparing to be spun, tow and other fibrous materials.

761. T. Roberts and J. Dale, Manchester—Imp. in the production of a substitute for oil used with pigments, and in the preparation of pigments suitable thereto.

Dated 25th April, 1858.

762. W. Agar, Recknburg, U.S.—An imp. in the dining machinery.

765. W. R. Jackson, Baltimore, U.S.—A self-acting railway lock.

167. H. Bayley and J. Groves, Southampton—Imp. applic. to certain machines for spinning and doubling flax or cotton.

766. Han. W. Talbot, Army and Navy Club, Pall-mall—Imp. in means or apparatus to facilitate the lowering and doubling of boats from ships or vessels, which improvements are applicable to lowering and discharging other boats.

Dated 18th April, 1858.

771. R. M. Ordish, 18, Great George-street, Westminster—Imp. in suspension bridges and suspended girder bridges.

772. G. Gavot, Dammia, France—Welding broken cast-iron pipes.

775. P. Brun, 1, Rue de Grenelle, St. Honoré, Paris—The application of an improved blowing fan to steady or purify gas, with or without reverberatory furnace, as well as to ventilation in general. (A com.)

777. S. T. Parmelee, Edinburgh—The manufacture of improved bridle for machinery or other purposes.

779. W. G. Armstrong, Newcastle-upon-Tyne—Imp. in the use of firing or igniting explosive projectiles.

781. D. McCrae, Greenock—Imp. in preserving ships' bottoms and other exposed surfaces from rusting and injury or decay.

783. A. Manbré, 10, Rathbone-place, Oxford-street—The manufacture of a colouring matter for colouring spirits, brags, and other liquids from the sugar of potatoes, known as glucose and syrup "de fécule."

785. A. C. Thibault, Paris—Imp. in the manufacture of paper-hangings, and in the machinery employed therein.

Dated 12th April, 1858.

767. S. Bickerton, Oldham—A thermo-pneumatic indicator for driving shafts, axles, machinery, &c.

INVENTIONS WITH COMPLETE SPECIFICATIONS FORWARDED.

841. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—A certain medicinal compound for the treatment of epilepsy. (A com.)—17th April, 1858.

842. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—An improved system of portable tents for railway and other purposes. (A com.)—17th April, 1858.

843. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—An improved substitute for the pulverized cotton and wool employed in the manufacture of felted tissues, papers, and other fabrics. (A com.)—17th April, 1858.

WEEKLY LIST OF PATENTS SEALED.

April 23rd.

2703. R. Harfield and H. Harfield.

2707. J. Macintosh.

2710. J. Thom & D. McNaught.

2711. Jas. Fairclough, J. Fairclough, and J. Cowan.

2716. J. Ferrabee and C. Whitmore.

2718. W. Clarke.

2721. J. Newall.

2726. H. J. Daniell.

2730. P. A. M. Maury.

2733. G. Shillibeer and G. Giles.

2734. J. Sloper.

2740. John Child and Jos. Child.

2743. R. A. Ronald.

2766. G. B. Galloway.

2769. T. Lowe.

2794. A. C. Sacré.

2801. R. I. C. Dubus.

2811. J. J. Consins.

2850. A. J. Davis.

2855. S. Webster.

2879. J. Gedge.

2887. E. D. Johnson.

2933. A. V. Newton.

2937. J. Schlem.

2968. F. G. Orles.

2968. J. Summers and D. W.

2997. J. Lavery.

3042. T. W. Willott.

147. A. Bird.

245. E. Carte.

264. W. Armistage.

301. G. Baker and J. E. Balm.

329. W. Thomson.

350. W. Johnston.

412. G. J. Parson & T. Pugh.

April 23rd.

5727. J. Addison.

2741. H. Taylor.

2744. W. Greening.

2746. D. de la C. Georley.

2748. T. Cook.

2752. E. Smith.

2759. W. Harwood.

2763. B. Knowles.

2774. P. Gabbins.

2785. J. Apperty and W. Child.

151. J. Childs.

269. S. Smith.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 19th.

880. H. Macé.

886. R. Bright.

913. J. Hunter and G. Hunter.

April 20th.

892. W. Hadfield.

921. L. A. Aisso.

946. W. Shears.

1071. J. Hardman.

April 21st.

903. J. Whitworth.

923. J. Wallon, Junr.

April 23rd.

916. M. A. Muir.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4060	April 21.	Chimney Top	T. Parr	55, Lower Union-street, Turky.
4061	" 24.	Corset Fastener	J. Pierre and Co.	82, New Elvet, Durham.
4062	" 26.	Wrought-iron Window and Frame	Burt and Potts	York-street, Westminster, S.W.

Journal of the Society of Arts.

FRIDAY, MAY 7, 1858.

THE SOCIETY'S CONVERSAZIONE AT THE SOUTH KENSINGTON MUSEUM.

Members are requested to take notice that the next Conversazione will be held at the South Kensington Museum, on Saturday (to-morrow) the 8th of May. The doors will be opened at 8 o'clock.

The following divisions of the Museum will be lighted on this occasion:—

1. The Sheepshank's Gallery of Pictures.
2. The Sculpture Gallery.
3. The Architectural Museum.
4. The Animal Produce Collections.
5. The Ornamental Art Collections.
6. The Structure and Building Materials Collections.
7. The Educational Collections.
8. The Collection of Patented Inventions.
9. The Photographic Society's Exhibition.
10. The Art Training Schools.

The following objects will be exhibited to the public for the first time:—

1. A Model, showing the Campaign before Sebastopol, executed by Col. Hamilton, C.B., Grenadier Guards, at the suggestion of his Royal Highness the Prince Consort, for the United Service Institution.
2. Statue of Venus, by J. Gibson, R.A., and the picture of the "Duchess of Burgundy distributing Alms," by Leys (the celebrated Belgian artist), will be lent by Matthew Uzielli, Esq., a member of the Society.

Carriages are to set down at the refreshment entrance. The band of the 1st Life Guards will be in attendance.

TENTH ANNUAL EXHIBITION OF INVENTIONS.

The number of visitors up to yesterday, the 5th inst., was 4,342.

TWENTY-FIRST ORDINARY MEETING.

WEDNESDAY, MAY 5, 1858.

The Twenty-First Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 5th inst., Sir Thomas Phillips, Member of the Council, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Edgar, George | Lane, Edward
Raynham, Viscount, M.P.

The Paper read was—

IRON: ITS COMMERCE AND APPLICATION TO STAPLE MANUFACTURES.

By CHARLES SANDERSON.

The importance of the manufacture of iron, as a metal required for the various wants of mankind, has called

forth the energies of the chemist and the mechanic. It is not found in a metallic state. Nature has mixed the ores of this metal with a vast variety of substances, from which it is necessary to separate them, before they are serviceable for useful purposes.

The ores principally used for the production of iron are before you: the black oxides, being generally a mixture of the per and protoxide; the peroxides, which embrace many varieties, as hematites, hydrates, &c.; the sparry carbonates, or steel ore; and the earthy carbonates, which are so largely found associated in the coal basin.

It is not necessary for me to give you any detailed account of the localities of these minerals, because this has been recently laid before you, and their geological position has been fully treated. I may briefly remark, that the black oxides and hematites, being very rich in metal, are principally smelted with charcoal as a fuel, whilst the earthy carbonates are reduced with coke or coal.

The period at which iron was first produced is lost in the most remote antiquity. At present, it would consume too much time, were I to trace the progress which has been made, from the earliest known mode of production up to the colossal means now employed. Possibly it might be a very interesting investigation, but is certainly not necessary to our present inquiry.

Metallurgy is a science of vast extent in its application, and in its practice draws largely upon the researches of the chemist and the mechanic. Whilst geology and mineralogy direct the inquirer where he may hope to discover the hidden treasures of the earth, they shed a light upon that information which leads to a knowledge of their position, and the state in which they are found; chemistry enables the metallurgist to ascertain both the quantity and the quality of those substances which nature has mixed up with the metal, and it opens a wide and interesting field of investigation, in what manner the metal may be obtained in a useful state, at the lowest possible cost; and mechanical knowledge lends its aid, in the construction of those machines which are required, not only to enable the miner to obtain the ore and fuel, but also to reduce the cost of the subsequent manufacturing operations.

In England, these acquirements have been attained in so high a degree, and the application of scientific knowledge has been so successful, that our iron-works now stand models at once of intelligence and ingenuity.

The progress of the manufacture of iron, from the earliest period to the present time, has been marked by the diligent researches of men of high capacity, whose united efforts have produced the comparatively perfect system we now employ.

The immense iron establishments of England stand pre-eminent, both as regards the mechanical skill which they display, and the practical management which is continually exerted. Machinery is made to produce economy in every department, and a result is thus obtained which appears to defy the competition of other countries. Intelligence and industry at home have enabled us to afford our products at so cheap a rate, that our iron has found a market in every civilised country. If the produce of the soil be looked upon as the greatest source of national wealth, doubtless the metallurgical products of the kingdom stand next in importance, and influence the rise and progress of this wealthy and powerful nation—due to the industry, perseverance, and acquired knowledge of a population whose energies turn to account our mineral riches, by exercising that untiring energy which marks so prominently the English character.

I will not enter upon a detailed account of the manufacture of iron, which has been so often explained, yet I shall be obliged to notice, as I proceed, a few of the processes, because I shall have to remark upon their present state of perfection.

becomes more or less mixed with the metal when it is in a state of pig-iron.

Although the blast furnace is the most effective, and also the most economical, for reducing iron ore, yet we find that there is an actual loss, equal to 80 per cent. of the effective usefulness of the fuel. This fact is arrived at from the theory I have laid before you of the formation of gases in the furnace, taking the melting point of pig iron at 2192 Fahr. The fuel used together with the blast injected into the furnace, will give the quantity of carbonic oxide, light hydrogen, &c., which, when burned with heated air, would be sufficient to reduce or melt a given weight of iron from its ore, which in theory is estimated at between 16 and 17 per cent. of the value of the fuel consumed. These gases, so largely produced, are now collected in many works by means of pipes variously arranged, and inserted a few feet below the mouth of the furnace. They are used, mixed with a certain portion of atmospheric air, as a fuel for raising steam, heating the blast for the furnace, and on the Continent for the purposes of puddling; also for drying and arborescing the ore prior to its being charged into the furnace. If these gases are taken as they arise from the furnace, I see no objection to their being applied to useful purposes, but I do object to even the least forcible means being used to draw them from it. No current ought to be created in any apparatus which may be formed for conveying away these gases, since it would cause them to pass too rapidly through the furnace, and thus prevent them from producing their full effect upon the materials through which they are made to pass. This utilisation of the waste gases is highly interesting, and presents a wide field for application, besides which there is an evident economy to be obtained from their use, provided they are properly withdrawn from the furnace.

In the reduction of iron ores, it is very important to obtain the resulting metal in a state as free from deleterious matter as possible. To effect this, the ore is wasted to disengage all volatile matter and disintegrate the mass, such fluxes being used as shall, in the process of smelting, form vitreous compounds, by entering into combination with the earthy matter contained in the ore and fuel. Instead of giving any chemical formula, in order to show the relation one earth has to another, or the exact proportions of each which are required to form slags of sufficient fluidity, I will suppose that an iron ore is taken of a silicious nature and smelted alone, the result would, of course, be a silicate of the oxide of iron, like heavy cinder. We will look upon this combination as that of an acid with its base, the acid being combined with the oxide of the metal. In order to liberate the metal, this combination must be decomposed by some other alkaline bases which have a greater affinity for the acid, and unite with it, forming new compounds, at the same time liberating the metallic oxide; so it is in the blast furnace. Iron ores become soft during the process of deoxidation, they eventually melt, and in that state require to be in immediate contact with one or more alkaline bases, so that they may prevent the formation of the silicate which would otherwise take place. Limestone is the matter used for this purpose; it is well adapted to the object, but, in my opinion, the large amount of carbonic acid which it contains is prejudicial, because, in its descent, volumes of this gas are given out, which absorb a large portion of the heat from the materials in the furnace, thus cooling the region where such absorption takes place, and often producing very serious derangements in the working of the furnace. Since a certain amount of alkali is required to saturate the silicious matter, that object would be best attained by introducing such alkali in as condensed a form as possible. I am therefore a strong advocate for the use of caustic lime instead of limestone, because the carbonic acid which forms 40 per cent. of the bulk is not wanted, and it is a waste of fuel to heat so large a mass of what may be

called sterile material. Salt has been proposed as a flux; and in small doses will be found very beneficial.

Sir Francis Knowles, struck with the functions of the cyanide of potassium, proposes to introduce potash, felpar, or soda into the furnace charges; he adds lime, equal to two-thirds of the weight of the silica contained in the felpar; the bases then become lime, alumina, and the alkali, which being in excess, is released to form the cyanide required; he states that his trials have given him a cinder entirely free from iron; he has also patented the use of kaolin or china clay as a flux; this substance consists of 47 per cent. alumina, and 52 per cent. silica, so that even when the silica is neutralised there yet remains 30 per cent. of alumina to act upon that contained in the ore; kaolin is thus much superior to shale, which only leaves about 10 per cent. of free alumina after the silica is neutralised. I believe some experiments are now going on to smelt forge cinders with kaolin, and, if they are successful, this substance may be beneficially applied to all silicious ores. He further proposes to deoxidize the rich ores prior to their being charged into the blast furnace, by charging them into large retorts heated cherry red, and passing through them a current of carburetted hydrogen gas, which he obtains from the coke ovens; he finds that peroxides can be thus converted into protoxides in two hours, and that in three or four hours they assume the appearance of metallic iron; ore so prepared, he states, will at once go down as grey iron on arriving at the boshes; as an economical means of carbonising the ore, he takes the waste gases of the furnace and passes them in a highly heated state through the fuel to be coked; the gases evolved are stored in a gasometer for use.

Many ingredients have been from time to time proposed for improving the quality of crude iron, but acting as they do upon so large a mass of matter, but little benefit has yet been derived.

The pig iron which is produced from blast furnaces varies in quality, that is, the iron is more or less mixed up with matter which is not metallic, whilst the iron itself contains more or less carbon. In charcoal furnaces, in which the rich ores are generally smelted, and in which the fuel is not so strong as coke to withstand the strong blast, or the superincumbent pressure of the ore, great care is required in adjusting the burthen of the furnace; if a heavy burthen of ore be used, with a view of obtaining cheap pig iron, using only a small portion of fuel, it is very evident that the ore will pass too rapidly through each region of the furnace; it thus retains and carries with it a large portion of deleterious matter, and but a small dose of carbon; such metal is thus unfit for casting purposes, and when manufactured into malleable iron produces much waste, and retains all the bad properties which the metal contracted in the blast furnace.

The trade divides the qualities of pig-iron into numbers, 1 to 4; the more carbon it contains the more fluid it becomes on melting. No. 1, is that most highly carbonized; 2, 3, and 4, contain each a less degree of carbon, whilst the common white iron contains only a small portion, having been made to pass too rapidly through the furnace, and consequently become mixed with much deleterious matter. Nos. 1 to 3 are principally used for casting purposes, whilst No. 4, and all metal less carbonized, is used for the manufacture of rails, and common malleable iron.

There has been much controversy as respects the relative strength of hot and cold-blast iron; I do not propose to give at length the reasons alleged by the supporters of the superiority of either kind; but I wish to observe that, inasmuch as iron becomes stronger in proportion as the metallic molecules of which it is composed are brought closer together, it appears to me most probable that pig-iron produced by cold blast, and under such circumstances as to ensure the production of the purest iron, would be most likely to produce the strongest material for casting purposes. With this theory, as re-

gards the strength of iron, I must at present leave this most important matter, although much more might be said upon a question which has been too often the cause of serious accidents, but which involves so much minute inquiry that my time will not allow me to say more than to express the opinion, that pig-iron may be materially improved for casting purposes, and made much stronger for mechanical and engineering objects, as well as the no less important purpose of ordnance. I base this opinion upon the theory I have just advanced, that iron increases in strength in proportion as the molecules of the metal are brought closer in contact, without producing crystallisation; and this can only be effected by discharging a large portion of that deleterious matter with which the metal becomes associated during its production in the blast furnace, and, as iron for casting purposes can be thus improved, its application will be materially increased.

In the foregoing, I have endeavoured to explain the theory of the production of pig-iron in the blast-furnace, and, at the same time, have endeavoured, as far as possible, to make this theory agree with every-day practice, although I have condensed the subject into the smallest space, yet I feel how very little my time has allowed me to lay before you, upon the manufacture of a metal which finds employment for so large a portion of our population. The plans which have been proposed for the utilisation of the waste gases are a subject of great interest, since this is the only step which has been made to recover the effect of that fuel which is now lost. The relative effects of coal as a fuel, instead of coke or anthracite, I have not been able to touch, whilst the use of fluxes I have simply reduced to a general theory. I trust, however, that these points will be taken up by others, since they are sufficiently important to form separate papers for discussion before the Society, the principal aim of which is, to advance the improvement of our staple manufactures; and this can only be done by eliciting from practical men descriptions of processes generally in use, and particularly encouraging improvements.

Pig-iron I assume as the crude raw material from which its staple manufactures are produced. A very large proportion of the pig-iron made in this country is converted into malleable iron. Common iron and rails are made from the cheapest descriptions of pig-iron, but for the better kinds a superior pig is used, and for the best iron refined metal alone, or mixed with charcoal pig-iron. In those works in which common iron is made, the blast furnace manager's talent is exercised in keeping his furnace exactly in such a state as is favourable to the production of a maximum quantity of iron, with the least possible consumption of coal, or waste of the materials used. Under such circumstances, it cannot be expected that a pure iron will be produced, the effort made to obtain quantity necessarily affecting the quality.

In the manufacture of merchant bars, and iron of similar quality, pig-iron is charged directly into the puddling furnace, and is subjected to a process called boiling. Malleable iron thus produced is much inferior in quality to that obtained from refined metal, because all the deleterious matter which the pig-iron contains, being mixed up with the metal as it is being puddled, necessarily becomes more or less incorporated with it, and materially affects the quality of the puddled bar. Being alloyed with the silicated slags produced, its power of tenacity and strength becomes weakened. The waste in the puddling furnace is very large, and this loss is again seriously felt in all its subsequent manufacture, being caused by the absorption of a large portion of metallic matter by the slags produced from the impure iron. I have been told by the chief managers of two of the large Welsh works, that they had, on an average throughout the year, consumed 28 cwt. of pig-iron in the production of every ton of railway bars. In the manufacture of malleable iron, we find the cost consists of coal, labour, metal employed. If the puddling furnaces

are well-constructed, no material economy can be made in the present consumption of coal, and in the ordinary state of trade no reduction can be expected in the cost of labour. If, therefore, economy is to be made in the manufacture of malleable iron, it must be by a reduction in the waste of metal which is now experienced in puddling and other furnaces used in iron-works. In Wales, this large waste is experienced by the use of a low carbonised white iron, containing much foreign matter; but in Scotland, a similar waste results from the circumstance that the pig iron is too highly carbonised, from which cause it has to remain much longer in the puddling furnace before it can be brought into nature. This prolonged application of the heat produces so large a waste, and entails such heavy work upon the puddler, that in Scotch malleable iron works it is the custom to refine part of their pig iron in order to get rid of a portion of the carbon, and thus accelerate the puddling process. The intermediate plan of refining pig iron has been introduced between the blast and the puddling furnace, in order to clear away, as far as possible, that foreign matter which it has taken up, as well as to dissipate a portion of the carbon, but since it is absolutely necessary to keep the cost of the production of bars or rails within a certain limit, it is impending upon the manufacturer that such operation shall entail no ultimate expense, and this can only be effected by reducing the waste of iron so low in the puddling and reheating furnaces, that the weight saved shall compensate for the expense of refining. The present plan for producing refined metal is very costly, averaging 1½ when pig iron cost 70s. per ton. This becomes a serious charge upon the metal in its earliest stages of manufacture, and although malleable iron made from refined metal is much superior to that made from pig iron, yet owing to the great expense of refining by the usual process of a strong blast, together with the waste experienced, and cost of fuel and labour, the prime cost of the finished bar becomes so seriously affected as to prevent its general use. I have devoted considerable time and expense to this desirable object, and I have succeeded in producing a highly decarbonised refined metal, at a cost not exceeding 5s. to 6s. per ton, including waste and every other expense. This metal produces a puddled bar with a waste of only 1½ cwt. per ton upon very common iron, and as low as 1 cwt. per ton, if the refined metal be made from strong forge pig iron. Upon a calculation, based on the manufacture of 100 tons of Welsh iron, re-melted from the pig, ½ being white iron, and ½ mottled pig, the waste in refining was 90 lbs. per ton, and upon a quantity of 60 tons, drawn directly from the blast furnace in a fluid state into my refining furnace, a loss of only 60 lbs. per ton was experienced.

Two furnaces in one of the large Welsh iron works puddled this refined metal for twelve consecutive days, and the average waste during that period was only 84 lbs. per ton; the pig from which this iron was made had no cinder in its composition. I present for your examination several samples of this refined metal, which is produced with the greatest facility; also of the slags which result from it. The objects of this process are to reduce the loss of metal, and to use coal instead of coke as a fuel; to effect a uniform decarbonisation of the pig iron without the use of blast, to use a chemical reagent capable of giving out oxygen during its decomposition, which, taking up and uniting with the carbon evolved from the metal, produces carbonic oxide gas, and this, acting upon the earthy compounds contained in the pig iron, precipitates the metal contained in them, by which means I obtain very clean, pure, crystalline metal, capable of being manufactured into superior malleable iron. There are samples of malleable iron manufactured from this refined metal, also a sample of the pig iron used to produce the refined metal, several tons of which were puddled in Yorkshire and rolled into rivet iron, which was used for rivets in the *Leviathan* steamship, and reported

iron when finished expended 2½ cwt. per ton. By this process of number 3 hot-blast pig, charcoal iron; the metal was poured into a bar, then converted and rolled into plates and saws which are exported from this steel, and show the quality which they have been made. From the rough puddled bar, without conversion. These plates, under the inspection of the Government for small arms, at Birmingham, are used at the proof house. Samples of this quality of iron; but it is the purest iron which has been melted and thus divested of its impurities.

It is a proof also of the great strength which iron acquires when the metallic particles are brought close to each other. My plates have been successfully tested for tin plates. This iron made in the puddling process, with charcoal, in both instances is one-half when compared with the metal manufactured from it are referred to.

The metal has also been found to be of the same quality as the charcoal pig iron when used for the common cutlery, called run steel. You will show that it admits of being tempered.

Whilst additional strength can be obtained by taking it from earthy matter, yet in reducing the amount of carbon, it crystallizes; a fine grain is favourable, which can only be attained by the pig-iron itself, when very strong. I recommend that the pig-iron should undergo a remelting, adding such a quantity with much of the earthy matter, but which will not extract the carbon, but will make stronger castings, because the particles are brought in closer contact; I believe that an addition of my refined puddled iron will give still greater strength. This metal is not fit for castings; it is as brittle as cast steel, because the disintegration arising from crystallization, weakens the metal.

I am advanced in favour of the manufacture of cast-steel. I do not think that good pieces of artillery can be manufactured from it. There is no great practical difficulty in casting of steel 2 or even 3 tons weight, but crystallization of so large a body of steel, of 50 lbs. in a crucible, is unfavourable to the molecular structure which such castings possess. Since upon their excellence often depends the success of a siege or action.

Wrought-iron ordnance cannot be depended upon to be better than cast steel, but their perfection is impaired by the necessity of piling masses of iron. I admit that a weld can be perfectly made, and that surfaces when oxidized can never become one body, without the oxygen be reduced at the time when the union is effected. Wrought-iron guns which have given excellent results when fired at slow intervals, but when continuous quick firing were kept up, I doubt whether they would be able to withstand the shocks; they would, after each round, become gradually weaker at the welded surfaces.

It is of very great importance that some means be devised for producing a material combining the strength with durability, not only for the construction of rails, but also for tubular bridges, steamships, and a great variety of similar purposes, not only to secure a long life, but also to secure an eventual safety. No plan appears so effective as that ob-

tained by the union of iron and steel; such a compound metal will, I believe, furnish a better and a cheaper means of effecting this great object than by the use of iron alone. Large masses may easily be obtained through the medium of the welding property of cast steel in a fluid state. A bloom of iron is heated white hot, placed in a cast-iron mould, and fluid steel is poured against it; the effect is, that the carbon of the steel reduces the oxide on the surface of the iron, and a union like that of silver plated on copper is obtained, rather than a common weld. Two pieces of iron may thus be united, by pouring cast steel between them when heated, forming a mass of great strength, and useful in machinery, where considerable strain is exerted, on account of the stiffness and strength of the steel being united with the toughness of the iron.

Now, more than ever, we require the means of rapid transit in our Indian possessions, to enable us to retain our supremacy in that distant portion of our empire; present experience shows us that we must take immediate measures to enable us to concentrate at any one point those means of resistance which must, in future, be kept at all times ready to protect both life and commerce. To do this, main lines of railroad must intersect the length and breadth of India, whilst light draught steamers must open out an inland navigation which does not now exist. A compound metal of iron and steel, from its combined strength and lightness will, I believe, furnish a better and a cheaper means of effecting this great object than any which can be obtained by the use of iron alone. I beg to submit to your notice a new form of rail; it is made from a thick plate of iron and steel united as described; the plate, when hot, is bent up into the form of a rail, the steel coating being outside, before the bar is cold; it is hardened by being plunged into cold water and tempered in the usual way; by these means are obtained, not only great combined strength by the union of the two metals, but a further addition of it, equal to 38 per cent., is made by hardening and tempering the steel, which not only prevents the running surface from rapid wear, but, what is of the greatest importance, such rails can never laminate—the elasticity acquired by the hardened and tempered steel portion of the rails will prevent them from setting when bent by sudden and undue pressure; they can be made of any thickness, according to the nature of the traffic; the main line might be laid with rails like the thicker model, which is equal in strength to the double-headed rail now used, which weighs 84 lbs. per yard; but many districts might only require rails like the lighter model. The advantages this rail presents are great strength, great resistance under undue pressure, a hard non-laminating surface, which will wear very much longer than those now used; but the most prominent value is their extreme lightness, combined as it is with great strength, which becomes of such high importance in the first cost of a railway. The rail of the heavy model is 86 lbs., and that of the light one 26 lbs. per yard; if you admit for a moment that my statement is true as respects their strength and other qualities, allow me to suggest to you the valuable advantages which such a rail presents in point of economy, and the large saving made, especially to colonial railway companies, not only in freight from England, but the more serious expense of inland transport. I will not go into the various forms which engineers might think it best to give to rails made from such material, but there does seem to me one great advantage in the mode which I have adopted to attach the rail to the chair. The model of the saddle rail is like that used on the Great Western, but it is stronger on account of the material used. In countries where wood is cheap, a modification of this rail might be laid down very economically.

I propose the use of iron and steel united in a bloom, and subsequently rolled to a sheet, hardened and tempered in order to obtain the maximum amount of rigidity.

combined with strength, as a material for the formation of steam ships; and it will be found equally useful in the erection of tubular bridges, and many other engineering purposes.

In these days of steam navigation, I would request of those who are engaged in building iron steam-ships to investigate the usefulness of such material, and to inquire into its cost. No doubt it may be expected to be expensive. I am enabled to state, however, that it can be produced at a sufficiently low price to ensure its use, and whatever increase there may be in cost, will be more than compensated for by the difference of weight required of this material contrasted with that of iron.

The value of puddled steel has recently been brought under your notice. I can add little to the opinion I then expressed; the process will certainly produce steel, but from the nature of the operation itself, it must be evident that the quality is continually subject to great irregularity. All agree that the greatest care is necessary to produce it. More uniformity may be obtained by breaking up the rough bar, selecting them when cold, and welding them together; still the mass is simply steel combined with fine fibres of iron intimately intermixed. It will become a useful metal for a great variety of purposes where a cutting edge is not required, but looking at puddled steel as a raw material to be manufactured by the peculiar process which has been described in the patent, I still think that if refined metal were puddled, shingled, and rolled to a bar, and then converted into steel by the usual process, a cheaper and more uniform material would be obtained. I take this opportunity of repeating, that the conversion of bar-iron into steel ought not to cost more than 18s. per ton. My calculation is drawn from careful accounts kept of the working of ten converting furnaces for five years, during which period one-half of the iron was converted for hard melting purposes. From this, I positively affirm that the conversion of puddled bar-iron, in order to give it as much steel character as that possessed by puddled steel, ought not to cost so much as 18s. per ton, including every other expense.

Some engineers have objected to rails, even if made from cast steel. They say no dependence can be placed upon such a material, because it has no toughness. Its crystalline fracture is objected to, on account of brittleness, especially in very cold climates. The form of rail which I have submitted to you might, of course, be made wholly from steel, but I object to this material, because rails are subject to sudden violent concussions, which might snap a steel bar, and thus place the line in danger.

For some time past our scientific journals have been filled with various projects for the production of steel, especially cast-steel, at very cheap rates. After all the apparently feasible projects which have been suggested, nothing of any importance has yet been done to attain this object; the steel which has been produced by these various processes does not appear to possess that quality which has been so positively stated; hitherto cast-steel has been made varying from £65 to £80 per ton, each quality being practically useable for the manufacture of steel articles. The manufacture of such steel has hitherto been the peculiar province of the Sheffield makers, but let it not be supposed that they can make no other material than that used by the cutler, the tool maker, and the engineer; let them see that a want is created for a steel suitable for the manufacture of shafts, steam ships, tubular bridges, and other like purposes, where strength and rigidity are the principal acquirements, it will be found that they are the best able to suggest modes for producing such an article, of uniform quality and at a cheap rate. Science can greatly assist art in producing the kind of steel required for general engineering purposes.

I esteem this combination, I would practical metallurgist not to come to m laboratorial experiments. With ocated the idea of great expense;

good steel will always sell at a price consistent with its intrinsic quality, and, if care, skill, and expensive raw material be required to produce such a steel, an adequate price will always be found for it; but, if, on the other hand, a metal be required combining within itself a much superior strength and rigidity than iron possesses, I feel no hesitation in saying that it can be produced by the large steel manufacturers of Sheffield at a cheaper price and of a better quality, than by any of the peculiar processes patented within the last few years; although I do not think that a process is yet discovered which secures the minimum cost price of the production of such material yet this enquiry is going forward, and will, doubtless, be speedily arrived at. Whether such discovery emanate from existing steel-makers, or from others, not engaged in this trade, its production, at a cheap rate, will confer the greatest benefit, not only upon our railroad requirements, but also upon our steam navigation; we may then hope to have better and more efficient rails, stronger bridges, and safer steam-ships.

As regards the direct conversion of pig-iron into malleable iron or steel, without the puddling furnace or charcoal refinery, I have already expressed a strong opinion, when that process was first proposed, at the meeting of the British Association, at Cheltenham.* I still see no cause to change the opinion I then expressed, that neither practically useful malleable iron, nor cast-steel, could be produced direct from pig-iron. It is by no means a common practice to use refined metal (which is decarbonized pig-iron), as a mixture with any common material, such as scrap iron, clippings from old boiler plates, and the like, to produce a common cast-steel, which is sold at from £16 to £18 per ton, for making mill saws, and several very common cast-steel articles, but the only quality, as a steel, which it possesses is, that it will harden and temper.

When it was found that the decarbonized pig-iron, resulting from the process of blowing a strong blast of air into a body of fluid iron, would not roll or draw under the hammer, Mr. Robert Mushet patented several processes, with a view of rendering this product malleable; manganese, mixed with carbonaceous matter, is suggested by him as a means of obtaining malleability; he asserts that he can operate upon one or twenty tons of fluid metal, by blowing a strong blast into it, and when, by this means, it is decarbonized by adding from 2 to 20 per cent. of manganese and carbon, he professes to change a brittle metal into one capable of being rolled, or hammered, hardened and tempered. There is a sample of Mr. Mushet's steel, but I have no information as to whether it has been produced in the manner described, or whether he has had recourse to the crucible to remelt this metal.

A patent was taken out a short time ago for mixing decarbonized metal with malleable iron; this process was first carried out at some cast-steel works belonging to Prince Schwarzenburg, at Murau, in Styria; the late Mr. Heath also used it at his works at Chelsea; in both these instances, although the finest charcoal metal was used, yet a good quality of steel was not regularly produced; as a manufacture, the process was imperfect.

Patents have also been taken for the production of cast-steel from iron ore; many experiments have also been tried, both in England and France, to produce a cheap steel from such an inexpensive material; by Monsieur Chenot's process, the iron is separated from other deleterious matter by an electro-magnetic machine; to the material so obtained, a thick lime water is added, to prevent the particles sticking together, and forming a compact mass during the process of decoxidation, which is performed in small perforated iron vessels, by passing through it a current of carbonic oxide gas; this decoxidized spongy mass is then steeped in any kind of fatty matter; from this source, he says he obtains the constituents of steel; he proposes also to condense the spongy matter by pressure, and submit it to the usual process of cementation; it is then to be melted into cast-steel.

There has been much said respecting a process for

producing cast-steel from a mixture of spathose iron ore and granulated cast-iron; but from the reasons I shall shortly lay before you, I think no successful or practical result will be obtained.

Sir Francis Knowles has also patented a process for making cast-steel from iron ore; he says, that if the complete success of the process be doubted, it is impossible to deny that it rests upon a theory both rational and consistent with chemistry; he looks upon the manufacture of cast-steel from British materials as of national importance, by rendering us independent of Sweden, or any other country. There is before you a complete set of samples of this steel, also a variety of manufactured articles, from which you can judge of the progress which he has made. His theory is as follows:—If the oxides of iron be placed in a closed retort or crucible in contact with charcoal, and submitted to adequate heat, the metallic part, as soon as it is deoxidised by the charcoal, begins to absorb carbon, and is, in fact, converted; if then no more charcoal be admitted than is exactly sufficient to deoxidise the ore, and to convert the metal to the required temper, it is plain that the absorption of carbon will then cease; and if at this stage the heat be gradually raised to the steel melting point, the production of steel must be the inevitable consequence. In sending the examples I am enabled to exhibit, he observes, in order to adjust the charcoal, we must know how much metal there is in the ore, and what is its state of oxidation; preliminary chemical analysis will settle this point. The next step is so to adjust the fluxes, that proto-silicate of iron may not be produced, and for this purpose chemistry must determine what earths are contained in the ore and the fluxes—a calculation must then be made, so that the aggregate may be a combination of the silicates of alumina, lime, magnesia, and the potash of the charcoal used. Magnesian dolomite calcined is preferable; in its absence the purest lime is to be used; the other flux he uses is kaolin, which is so rich in alumina; there is an additional value in this, as it prevents the corrosion of the pots, when in proper quantity. The best ratio of the earths is three silica, two alumina, two lime; samples of the cinder are here for inspection, being pure and free from protoxide of iron. The most striking feature of this "ore steel" is its very great density; this he ascribes to the total absence of the proto-silicate of iron in the cinder. Amongst the articles is a chisel, taken from an ingot; merely ground, and hardened, and tempered, it has cut to pieces a bar of file steel. This striking property has led to its employment for the cores of wheels and other important purposes. He also uses the Greenland cryolite, and cyanides of sodium and potassium, as fluxes. He has also contrived a furnace or cupola for making steel by this process; it resembles an ordinary blast furnace, except that the materials, mixed in proper proportions, are carefully secluded from the fuel, and descend through a long pipe of refractory fireclay, and through the various degrees of heat required, to the hearth of the crucible. Whether steel can be directly cast into ingots from such a furnace is at present doubtful; but there cannot be a doubt that a steel metal will be obtained. Sir Francis Knowles does not dissent altogether the present method of conversion; on the contrary, his opinion is, that, for certain purposes, it is the best and most economical, as for some of the milder tempers—but whenever the operation of melting is required at an intermediate stage, there he would substitute the direct method, and, above all, for cutting tools, of every description, and the highest class of cutlery. Such is Sir Francis's own statement.

The foregoing are the prominent processes which have recently attracted public notice, having for their object a reduction of the prime cost of making cast steel.

As regards all steel produced by the decarbonisation of crude iron—if we examine the peculiar state of this metal it will be found, that the mass is composed of atoms irregularly decarbonised and impure; besides which, we find in such masses of metal a variety of combinations, all

of which are opposed to malleability, because the aggregated molecules of such mass are not homogeneous, but are mixtures of metal existing under different chemical circumstances, which give to each molecule a different crystalline structure, so that, when heated, they expand unequally. All these opposite and conflicting states, in which decarbonised pig-iron is found, prevent the mass from drawing or rolling. If lumps of iron are drawn from the puddling furnace a little before the mass is balled up, a bright and crystalline metal is obtained, similar to this decarbonised crude iron; it is partially malleable, but it has no fibre to recommend it as an iron, nor has it carbon to entitle it to be called steel. Mr. Mushet has evidently the idea that the addition of his compound will produce one uniform crystallisation, favourable to malleability, and he appears to expect that an alloy will be found of metallic manganese with the iron, but analysis has shown that no such alloy does take place. Manganese, added to steel, in the crucible acts simply as a detergent; it cedes its oxygen to the silic, which the silicates of the metal may contain, and oxydises it; a union then takes place, producing a silicated oxide of manganese, in the form of a glassy slag; the metal becomes thus purified, because all foreign matter is separated, forming new compounds, which cannot again unite with it. In any attempt to produce cast steel from decarbonised pig-iron, it must be broken up when cold, and such reactive added to it when charged into the crucible as shall take up the deleterious matter and liberate the metal, which must be kept in a fluid state for a long time, until every particle is reduced to the same chemical condition, and thus rendered more favourable for malleability; but this is so nice an operation, and so dependent upon uncontrollable circumstances, that it is not reducible to practice.

As regards all those processes which have for their object the manufacture of cast-steel from iron ore, I may in part advance the above theory against their success, but there is another case which operates very unfavourably. Iron ore may be deoxidised and used as M. Chenot proposes, or it may be charged into a crucible along with carbonaceous matter and fluxes, and slowly heated until decarbonisation takes place; when the cementation is complete, a mass is obtained in the crucible consisting of earthy matter intimately mixed with steelified metallic particles, all which have to be melted down into one mass. I think no one can reasonably assume that all these metallic particles, intimately mixed as they are with the earthy matter, can be in the same chemical condition, nevertheless the metal must all be melted down in this imperfect state; the metallic part more or less carbonised and mixed with foreign matter falls to the bottom of the crucible, simply from its superior specific gravity; in order to give every chance for the matter to clear itself and become uniform, it might be kept in a melted state for some time, but for all this the operation carries with it no certainty either as regards quality or temper. I manufactured a ton of ingots from a very pure black oxide of iron; using every possible care, not more than 7 cwt. could be drawn into bars at all, and the fracture was very irregular, which may be observed in the sample; a part of this steel would not draw, but broke in pieces; the rest drew more or less imperfectly, and, on a careful examination, I found it very evident that the chemical condition of the metallic particles was so dissimilar that malleability could not be depended upon. In order or as far as possible to prove this assumed case of irregular malleability, I took soft steel in one crucible and very hard steel in another, and mixed with each a quantity of earthy matter, as nearly as possible to imitate the condition of the iron ore when melted; when they were completely melted they were intimately mixed together, and an ingot was cast; but although very carefully heated it would not draw; this was not because any earthy matter was mixed up with the metal, but because its carbonization was variable throughout the mass, which gave rise to such a confused diversity of crystallization, and caused so great a difference in the

degree of malleability of the atomic structure of the mass, that the action of the hammer at once broke up the ingot; the want of tenacity or disaggregation of the mass is often seen in large ingots, although made from good material; this is caused either from the irregular temper of the steel used, or from its having undergone a complete change in the crucible by over heating it, and thus causing a mixed crystallization; or it may equally arise from being under melted, which it is evident would produce the same effect. As I have stated, ingots of cast-steel can be produced directly from iron ore, but the best portions harden very irregularly, whilst the mass is usually so imperfect as to be unmerchantable. I admit that a cheap metal may be produced, but, as I have shown that there is no certain result to be obtained in its manufacture, so also there is no economy. I will not assume that those who have been so sanguine in the production of cheap steel can have expected to produce a superior quality suitable for the best purposes; I cannot suppose such to have been their object, but rather to obtain a cheap material in a fluid state, capable of being cast into large masses for engineering purposes, or objects which are now manufactured from malleable iron—such as shafts, beams, girders, plates for ships' bridges, &c., &c. In a commercial point of view, England is the only exporting country to any extent. Sweden sends to England about 30,000 tons annually for steel purposes; she also exports largely to India and North America. Russia also exports to England about 10,000 tons of steel iron; a portion is sent to the United States in bars and in sheets, which are manufactured by a peculiar process, having a very fine black polished surface; the rest of the produce is either consumed within the empire, or finds a market in Asia Minor and the East. Prussia has, within a few years, largely increased her production, and still continues to expand; she has not, however, exported her produce, but, on the contrary, has required considerable importations of pig iron; for in 1867 she received from England 67,297 tons, against 39,296 tons sent in 1866, being an increase of 28,001 tons, and equal to 67½ per cent.

France does not appear to have made any advance since the alteration in the tariff admitted English iron at a reduced duty, which all her iron masters are now seeking to repeal; it will, of course, become a national consideration, whether they are to hold the monopoly they seek, or whether the manufacturing population are to maintain their position—since the cost of iron in most countries is now becoming, as it were, the standard of its riches. In 1866 she imported from England 84,923 tons of pig iron; in 1867, 89,401 tons, making an increase of only 4,478 tons; whilst of rails and bars, in 1866, she imported from us 71,344 tons, and in 1867 only 30,136 tons, showing a large decrease of 41,208 tons. In the United States, although many of their iron works are not in operation, and others, like our own, at present doing very little, yet, in the early part of last year they were producing one million of tons of pig iron per annum, and from their vast mineral resources they will again, after a time, go on increasing; they do not export—on the contrary, in 1866 imported 58,600 tons of pig iron; in 1866, 46,762 tons, showing a decrease of 11,748 tons; again, in rails, bars, &c., in 1866, they imported 231,556 tons; and, in 1867, 221,430 tons, showing again a decrease of 10,126 tons. In sheets, plates, &c., in 1866, 45,714 tons were exported, and in 1867, 46,497 tons; giving a small increase of 783 tons. On the whole, therefore, it appears that their own resources have reduced the import in 1867 to the extent of 20,000 tons, this reduction may, however, have partly arisen from the existing state of their public works and general trade.

The exports to all countries, for the first three months of the present year, show a decrease upon 1867 of 149,021 tons. The decrease has been chiefly to the United States, being 118,236 tons out of the whole. The total decrease of our exports this year is 31 per cent., equal in money to

If, then, we take a review of the iron produced in different countries, we find that the charcoal iron produced all over Europe, is either consumed in the country where it is made, or sold to neighbouring states. Prussia, France, and the United States, alone make iron from coal cooke, but they do not export. England stands alone; her immense product supplies the want of every kingdom and nation. How is it that we have secured a position over all other countries, which enables us not only to supply iron cheaper than they, but also to pay the expense of transit, import duties, and a variety of other charges, and still compete with their own producers in their own markets?

We are fortunate in possessing large deposits of iron-stone and coal, but we are still more fortunate in possessing the highest intelligence, an industrious population, and unlimited pecuniary means for carrying out the production of iron upon the most extended scale. In mining, in the management of the blast furnace, and in all the various processes for the production of malleable iron, knowledge has been added to knowledge, experiences have been so multiplied, and the system of iron making is now so perfect in itself, that by the statistics of the British iron trade, we find England exporting iron and articles made therefrom to the enormous amount of £22,994,671, finding employment at home for a large industries population, and supplying freight for our own merchant navy. This state of things will not only continue to exist, but our exports must continue to increase, so long as, by our industry, capital, and knowledge, we continue to produce iron at so cheap a rate. Improvement in quality is highly important, if it can be combined with the economy now practised, and must give an additional security to our commerce. Iron masters may say, our plate-iron and our rails are good enough; I fear such an assertion could not be upheld; our rails, generally speaking, are not so good as they can be made, and the almost daily reports which we hear of the defects of our iron built steam ships, are proofs that this kind of iron might be improved, and this can only be done by giving the maker a better price. I am perfectly aware that to maintain our supremacy over other countries the most rigid economy is necessary, but if our large iron makers hope for prosperity, and if those who embark such large sums of money in iron establishments look for a manufacturer's profit, they must be careful how their money is expended in mines, machinery, and general works; they must avoid the incubus of a heavy dead capital. Certain works may be able to produce 1000 tons or more weekly, and I will admit (for my argument's sake) that the strictest economy is throughout observed, from the raising of the ore and coal, to the despatch of the finished iron; but upon all the various costs and charges which belong to the production of the iron, the interest upon a large amount of dead capital has to be brought into calculation, at such a rate as shall not only cover common interest, but also the wear and tear, and the yearly diminution in value of works in operation. I will not venture an opinion how heavily they bear upon some large works, nor can I say how much capital has been irrecoverably lost, for want, at the outset, of a clear knowledge of all the requirements of iron works, but I know that such an item does fall very heavily upon each ton of iron produced. Were it in my power to look back into the private history of many large works from their early commencement, and gradually to trace the expenditure of their capital, I should find large sums devoted to projects of which no vestige now remained; whilst the erection of the requisite machinery had cost more than double its original estimate. If such works were to be sold at a price ascertained by a fair valuation, perhaps, that which by degrees, one way or another, had cost £500,000 would be found not to be worth half that sum. If iron works are intended to pay, their projectors must bear in mind that every £1,000 sunk in the works, &c., will eventually inflict a charge per ton upon their produce; and the smaller such produce is, the heavier

EXPORTS OF IRON TO VARIOUS COUNTRIES IN THE YEARS 1866 AND 1867.

To	PIG IRON.						CASTINGS.						BOLT AND ROD.					
	Tons.		Declared Value.		Increase in		Tons.		Declared Value.		Increase in		Tons.		Declared Value.		Increase in	
	1866.	1867.	£	£	1867.	1866.	1866.	1867.	£	£	1867.	1866.	1866.	1867.	£	£	1867.	1866.
Australia.....	...	...	...	...	...	...	15,301	7,737	170,572	108,839	...	...	33,241	183,799	296,179	13,763	101,389	...
Brazil.....	...	...	...	...	...	...	3,992	4,728	61,612	61,785	...	...	...	...	...	...	...	...
British North America.....	12,428	15,922	45,866	61,764	15,896	...	5,283	5,933	33,697	44,168	642	5,601	32,596	48,632	287,677	414,532	15,066	126,565
East India.....	...	...	...	...	...	...	16,122	15,431	114,211	121,098	2,269	26,865	110,081	114,123	1,016,247	1,016,183	...	1,216
East Java.....	...	...	...	...	...	...	55	633	917	12,676	...	...	...	...	...	...	...	...
France.....	84,223	89,401	326,652	331,967	4,476	5,406	...	...	...	...	...	...	...	...	...	...	...	...
Hanse Towns.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Holland.....	54,268	83,226	212,021	328,566	28,968	116,546	...	...	...	...	...	...	...	...	...	...	...	...
Prussia.....	39,286	67,297	181,509	284,753	28,001	103,224	...	...	...	...	...	...	...	...	...	...	...	...
Russia.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Scandinavia.....	56,609	46,752	228,620	180,863	...	...	1,870	279	16,354	3,829	1,591	12,286	16,285	18,790	131,146	154,587	3,466	26,461
United States.....	...	...	...	...	...	...	3,867	22,101	30,865	1,752	8,764	...	...	...	...	...	...	...
Unenumerated Countries	107,921	120,617	430,630	455,564	12,696	32,974	28,396	32,212	287,743	341,661	3,826	43,918	173,028	209,464	1,535,949	1,583,467	36,436	287,918
Total in 12 months.....	387,236	423,215	1,385,118	1,611,467	77,637	274,016	72,392	72,760	712,177	764,619	9,991	117,000	9,008	74,556	701,913	721,401	6,267,065	60,427
	Deduct [Increase or] Decrease.....		11,748		...		...		...		...		...		...		...
	Total Increase [or Decrease].....		66,889		224,349		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		18½		16½		...		...		...		...		...		...
	Total Increase [or Decrease].....		398		42,442		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		1		6		...		...		...		...		...		...
	Total Increase [or Decrease].....		9,605		74,558		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		2½		...		...		...		...		...		...		...
	Total Increase [or Decrease].....		60,899		548,790		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		15½		...		...		...		...		...		...		...
	Total Increase [or Decrease].....		15,701		...		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		4		...		...		...		...		...		...		...
	Total Increase [or Decrease].....		1,437		191,633		...		...		...		...		...		...
	Per centage of Increase [or De-crease].....		13		7		...		...		...		...		...		...

HARDWARE.

SUNDY MACHINERY.

STEAM ENGINES.

SHEET, PLATE, AND SUNDY WROUGHT IRON.

To

To

EXPORTS OF IRON TO VARIOUS COUNTRIES IN THE YEARS 1856 AND 1857.

	TO BRAZIL.					TO EGYPT.					TO SARDINIA.				
	Declared Value.		Increase in 1857.		Tons.	Declared Value.		Increase in 1857.		Tons.	Declared Value.		Increase in 1857.		Tons.
	1856.	1857.	Tons.	£.		1856.	1857.	Tons.	£.		1856.	1857.	Tons.	£.	
Carriage	3,992	4,726	743	10,193	...	55	833	778	11,769	...	1,870	279	216,364	23,829	...
Wrought-iron, Bolt, and Rod Iron .....	...	...	...	...	...	...	...	...	...	...	16,386	18,790	131,146	164,687	3,408
Steam Engines	1,641	2,339	698	63,766	...	...	...	...	...	...	...	...	...	...	...
Hardware	4,533	7,115	2,582	73,939	...	85	833	778	11,769	...	17,156	19,099	186,009	193,879	3,408
Total in 12 months ..	Deduct increase or decrease		1,582	73,939	...	Deduct increase or decrease		778	11,769	...	Deduct increase or decrease		1,581	25,441	1,591
	Total increase or decrease		1,582	73,939	...	Total increase or decrease		778	11,769	...	Total increase or decrease		1,914	...	2,750
	Per Centage of increase or decrease		28½	41½	...	Per Centage of increase or decrease		1,411	1,382	...	Per Centage of increase or decrease		11	...	1½

	TO FRANCE.					TO HOLLAND.					TO PRUSSIA.				
	Declared Value.		Increase in 1857.		Tons.	Declared Value.		Increase in 1857.		Tons.	Declared Value.		Increase in 1857.		Tons.
	1856.	1857.	Tons.	£.		1856.	1857.	Tons.	£.		1856.	1857.	Tons.	£.	
Pig Iron	84,923	89,401	4,478	5,405	...	64,258	83,226	213,021	329,566	28,968	116,545	...	...	...	...
Rails—Bar, Bolt, and Rod Iron	11,344	30,126	18,782	41,208	370,543	15,773	27,511	153,318	240,456	11,738	87,137	...	...	...	...
Sheet, Plate, and Sundry Wrought Iron .....	...	...	...	...	...	17,603	20,408	236,799	229,438	2,906	...	...	...	...	...
Steam Engines .....	...	...	...	...	...	...	...	115,186	32,421	...	83,747	...	...	...	...
Sundry Machinery .....	...	...	...	...	...	...	...	85,398	134,035	...	45,727	...	...	...	...
Hardware	601	637	36	16,943	...	...	...	...	...	...	...	...	...	...	...
Total in 12 months ..	156,868	120,174	1,216,940	959,539	4,514	113,542	41,206	370,543	87,534	131,146	953,916	43,611	249,469	...	...
	Deduct increase or decrease		4,514	113,542	...	Deduct increase or decrease		41,206	87,534	...	Deduct increase or decrease		249,469	...	...
	Total increase or decrease .....		...	...	...	Total increase or decrease		43,611	169,901	...	Total increase or decrease		29,001	103,324	...
	Per Centage of increase or decrease .....		...	...	23½	Per Centage of increase or decrease		50	19½	...	Per Centage of increase or decrease		73½	67½	...

EXPORTS OF IRON TO VARIOUS COUNTRIES IN THE YEARS 1856 AND 1857.

[illegible]

SUMMARY OF TOTAL EXPORTS OF IRON, TO ALL COUNTRIES, IN THE YEARS 1856 AND 1857.

Description.	Tons.		Declared Value.		Equivalent in Pig Iron.		Increase in 1857.	
	1856.	1857.	1856.	1857.	1856.	1857.		
			£.	£.	Tons.	Tons.	Tons.	£.
Pig Iron	357,326	423,215	1,385,118	1,611,467	357,326	423,215	65,889	226,349
Castings	72,394	72,780	712,177	754,619	76,013	76,419	406	42,442
Rails, Bar, Bolt, & Rod Iron	701,873	721,401	6,217,524	6,257,065	935,830	961,868	26,038	89,641
Plates, Sheet, and Sundry } Wrought Iron.....	276,259	280,212	3,720,433	3,979,398	368,345	373,616	5,271	258,965
Steam Engines .....	.....	.....	819,067	1,062,286	54,604	70,819	16,215	243,219
Sundry Machinery .....	.....	.....	1,897,386	2,820,737	94,869	141,036	46,167	923,351
Hardware	34,738	39,250	3,747,598	4,016,327	74,952	80,326	5,374	268,729
Steel	21,868	22,321	735,823	748,381	32,787	33,481	694	12,558
Turned Plates.....	.....	.....	1,407,906	1,500,992	78,217	83,388	5,171	93,086
Wire.....	9,190	11,433	195,034	243,399	13,785	17,164	3,379	48,365
Total in 12 Months .....	.....	.....	20,838,066	22,994,671	2,086,728	2,261,332	174,604	2,156,605
Per Centage of Increase ...							8½ per cent.	10½ per cent.

EXPORTS OF IRON FOR THE FIRST THREE MONTHS OF THE YEAR 1858.

Description of Iron.	March 31,		March 31, 1857. Declared Value.	March 31, 1858. Declared Value.	March 31, 1857. Equivalent in Pig Iron.		March 31, 1858. Increase.	March 31, 1858. Decrease.
	1857.	1858.			Equivalent in Pig Iron.	Equivalent in Pig Iron.		
	Tons.	Tons.	£.	£.	Tons.	Tons.	Tons.	
Pig Iron	71,595	52,609	279,756	164,467	71,595	52,609	.....	18,986
Castings	21,780	16,492	200,646	178,714	22,869	17,321	.....	5,548
Bar, Bolt, and Rod ...	165,774	107,370	1,441,767	875,200	221,032	143,160	.....	77,872
Wrought, Sundry	56,239	35,930	812,953	560,759	74,985	47,906	.....	27,079
Wire	2,718	1,842	51,266	41,658	4,077	2,763	.....	1,314
Steel	5,375	2,372	186,002	91,032	8,062	3,558	.....	4,504
Templates.....	.....	.....	368,248	223,682	20,515	12,427	.....	8,088
Machinery .....	.....	.....	434,062	428,499	21,703	21,425	.....	278
Steam-Engines .....	.....	.....	244,221	231,025	16,281	15,401	.....	880
Hardware	8,948	7,168	902,866	679,267	18,057	13,585	.....	4,472
			4,921,782	3,474,303	479,176	330,155	.....	149,021
			3,474,308		330,155			
Decrease in 3 Months.....			1,447,479		149,021			
			29½		31			
								Per Centage of Decrease.

Nota.—The decrease in the Quarter has been chiefly to the United States, viz.:—118,236 Tons out of 149,021, and 25½ per cent, out of 31 per cent.

all this charge become. If, therefore, capital be recklessly dissipated, it may soon be discovered that the interest, and annual depreciation, will sweep away all profits, because, the number of tons of iron annually made will at last be so heavy an additional charge upon their actual time cost of manufacture.

Much might be said upon the position of works, but the cheap transit by railway of raw material renders this less a question of importance than formerly; the economical location of large works is a matter of very serious consideration; the means necessary to produce a required result should be well matured before they are acted upon, and applied with the greatest economy. Careful and frugal management is imperative in every branch of the manufacture, when we bear in mind that everything which falls short of the standard of economy (by which I mean all the calculations of cost in the manufacture of the iron) is a dead loss. And, whilst I refer to the manager, let me not forget the workman. If this useful portion of our population contribute so largely to the profitable investment of capital, it deserves, and ought to have, a

large share of consideration, both from the owners and managers of iron works. We must acknowledge that they perform their work with an intelligence and physical energy equalled by no other nation. Besides the common operations in iron works, a vast amount of skilled labour is continually required; these talented workmen secure to us that manufacturing pre-eminence we enjoy, and it is this union of action, this chain of circumstances, which has raised our staple manufacture to its present state of prosperity. Let, then, our labouring classes be cared for; if they give us their labour with free minds and willing hands, secure to each family a comfortable home; provide the means for a sufficient amount of education to their youth, and of offering up their united thanksgiving to their God. Whilst those exercising authority must at all times maintain their position towards the workmen, and insist upon order and regularity, I feel, because I know from experience, that a master, whilst he acts with firmness and decision, can, and will, command the respect, the unrelaxing duty, and I may also add the attachment of all those who work under his direction;

but such a master, to enable him properly to direct others, must know his business, and he must, in all his acts, make every man feel that he is able to detect the smallest neglect of duty.

When a nation has made rapid strides in any branch of manufacture, it is not surprising to find a natural as well as a laudable desire to follow in the same path. Whilst England may, at present, look round with some security upon the efforts of other countries, do not let us forget that amongst other nations, as well as our own, knowledge daily expands, and will lead them gradually and imperceptibly not only to imitate that perfection which we have attained, but also to add their own improvements. The progressive development of our mineral riches, particularly of our coal and iron, forms a formidable item in the estimate of our national wealth, it increases our importance as a manufacturing people, and strengthens our relative position with other nations, as well as in our own colonies.

Whilst we are engaged in laying down that mysterious link of intelligence with the Western hemisphere, let us not forget our own immediate requirements; we have the power, let us also have the will to bring our Eastern metropolis in direct communication with the rulers of that vast empire at home; let us hope to see her rivers, which everywhere stretch their arms throughout this land, teeming with riches and prolific vegetation, covered with light-draught steam-boats; let railroads open out the immense resources of a country which has successively enriched many European nations, and England's wealth and energy will then draw from this long neglected portion of our empire, those benefits which she ought long ere this to have enjoyed.

DISCUSSION.

Mr. DAVIES said he was particularly struck with the statement made in the paper that from the ordinary samples of Welsh iron, a good metal might be manufactured at a cost of 5s. per ton. All the ordinary processes that they heard of for the manufacture of cheap iron would not come up to that, and he should be glad to find that it was brought extensively into practice. He had frequently heard in that room many excellent theories propounded upon this subject, and he, for one, would be very gratified to see the results of them in practice upon a large scale, but nothing he had heard that evening gave him more pleasure than the statement with regard to the reduced cost of converting pig-iron into steel, which was known to be, at the present time, one of the most expensive processes in which iron manufacturers were engaged. With regard to the question of iron rails, he thought many railway engineers were at fault. Mr. Sanderson had spoken of so many cwts. of pig-iron being required to make a ton of iron rails, but it was to be remarked that a very large quantity of rails were made from that which could scarcely be called iron. Engineers did not always insist upon having the best article, but upon having an article according to the specification which they themselves furnished. Railway tyres were ordered to be of the best quality of iron, but when they came to rails, which he considered to be the most important element in the construction of a railway, a specification was given, based upon theory, as to how the rails should be made. The result of this was that the rails became laminated, making a renewal necessary every three or four years, and creating a liability to accident. It would be found that those lines which were the best constructed as regarded the quality of the materials employed, were the best paying lines. For proof of this, he might mention the North Eastern railway, on which the best quality of rails had been put down, and the result had been, that although the traffic on that line was extremely heavy, yet the expense of maintenance was less than on almost any other line in the kingdom. Engineers often inserted in their specifications that rails should be made "under the hammer," though it was very well

known that rails could be made in this way with almost any description of iron. There was an instrument called a "squeezer," which only squeezed the cinder into the metal, without getting rid of it; the squeezer was very inferior to the Nasmyth hammer, which could be so adjusted as to give the lightest or heaviest blows, according to circumstances, and with such an instrument as that, the best rails might be produced. The question of our commerce in iron was an extremely interesting one; and he thought it should be an object with us to show to our continental neighbours that they would be more largely benefited by buying cheap iron of us than by attempting to manufacture it themselves; for where was the labourer in the neighbouring kingdom of France who did not stand in need of a cheap piece of iron? and that could be obtained from the country alone. The present enlightened ruler of France had shown a desire to benefit the people by encouraging the introduction of cheap iron, and we ought not to neglect any opportunity of impressing upon the French people that they had to pay an extra price for their spades and their ploughs and other implements of husbandry, in order to support a monopoly amongst the iron masters of their own country. If our iron trade was extended in proportion to the development of that manufacture, and if continental nations would imitate our example in buying their commodities in the cheapest market, it would enable us to make iron still cheaper, on the principle that a large demand for an article tended to reduce its cost. With regard to America, they must bear in mind that the people of that country voluntarily consented to an iron tax, in order to support certain iron manufacturers at home. They had frequently been told in that room of the vast quantities of coal and ironstone that England possessed; and he might mention one fortunate circumstance, namely, that in South Wales they had coal, and ironstone, and limestone, all of which were ingredients in the manufacture of iron, in closer proximity to each other than, probably, in any other part of the world. These facilities enabled the iron masters of South Wales to hold their own pretty well, even in the present hard times. All the iron masters of England asked for was a clear stage and no favour, and they were prepared to feed the world with iron, which was almost as important an article as bread.

Mr. JOSEPH GLYNN remarked, that in the excellent paper now before them they had been told—not only how much had been done, and what great improvements had taken place in our iron manufactures—but it was shadowed forth that in many respects we were still deficient. It was stated that limestone contained forty per cent. of carbonic acid, and that atmospheric air contained seventy-nine per cent. of nitrogen and twenty-one of oxygen. The quantity of crude material put into the furnace to make a bar of iron was about seven tons of iron-stone, coal, and limestone, and it required three times that weight of atmospheric air to carry on the combustion necessary for the smelting of that mass of materials. It was fortunate, however, that pure air was to be had in plenty merely for the trouble of forcing it into the furnace; but large quantities of mixed gases were thrown off in a state in which they carried away a vast quantity of heat, which heat was in most cases totally wasted. There was a wide field for improvement in that respect. The relative strength of hot and cold blast iron had been touched upon in the paper. The was still a disputed point; but he thought the hot blast produced a material which, like many other things, might be advantageously employed for certain purposes; and at the same time, like high pressure steam and other steam means, it might also be used detrimentally. The hot blast might be used to smelt materials which contained a variety of compounds mingled with the iron; and they must not lose sight of the advantages which had resulted in Scotland from the use of the "black band," as pointed out by Mr. Mushet, and the great wealth that had been derived from the use of that material smelted by the hot

blast. These were points which afforded a wide field for investigation, and were well deserving the attention of ironmasters, opening up as they did a subject of extensive research both for the practical man and the chemist; and he regarded a paper such as that now before them as a great means of contributing to the advancement of this most important branch of our staple manufactures.

Mr. NEWTON, in reference to the remarks that had been made by Mr. Glynn, as to the waste of the gases thrown off from the blast furnace, said, it had been explained by Mr. Sanderson, that means were now adopted for utilising those products, and the heat arising therefrom. That process had been carried out, to a great extent, at Alsace, where large quantities of iron were manufactured; and it was also in operation at the Ebbw-Vale Iron Works. It was now become generally known: the patent had expired some years, and it could be adopted, with no cost beyond that of the apparatus. He thought, with regard to the process described by Mr. Sanderson, in his paper, that the use of refined metal in the manufacture of iron generally must be advantageous. When this subject of the manufacture of iron and steel was before the Society, on a former occasion, Mr. Sanderson wrote a letter, in which he alluded to this process of his, and he (Mr. Newton) took the liberty of expressing a doubt as to the cost at which it was alleged that bar-iron could be converted into steel. At the same time, he was quite prepared to admit the utility of the process, provided the cost were such as would enable them to produce the material at a reasonable rate. Mr. Sanderson appeared to have taken notice of these observations, and he now stated that he could reduce his refined iron at a cost of something like 18s. per ton.

Mr. SANDERSON said, that was the cost of converting iron into steel: the cost of converting the pig-iron into refined iron was a different thing—that was only 5s. per ton. When the iron was made into bar it cost about 2s. to convert it into steel.

Mr. NEWTON apprehended that included waste as well as labour?

Mr. SANDERSON said there was no waste.

Mr. NEWTON remarked that the great point was to get rid of the impurities in the metal. At what cost was that?

Mr. SANDERSON replied 5s. per ton.

Mr. NEWTON added—If that were so, he apprehended ironmasters would be very glad to employ the process. There was one point which Mr. Sanderson had not alluded to. He had not given them any statistics as to the relative strength of the refined iron as compared with the common iron; because, after all, this was a question which must be decided by figures. The only other point he alluded to, was with respect to some of those new processes of manufacturing steel which Mr. Sanderson appeared to think had not been entirely successful. He (Mr. Newton) would only say that he had seen excellent steel, both bar and sheet, made at the Mersey Iron and Steel Works, under the process described by Mr. Clay, a paper read before the Society some few weeks since, and as far as he was able to judge, it was a process which was likely to answer well. At the time of his visit to these works, Mr. Clay was making sheet-steel which was to be employed in the construction of ships, and the testing of the plates gave very satisfactory results.

Mr. HOBBS remarked that this was not the first occasion on which he had heard the opinion expressed in this room, that America was not likely ever to become a rival to England in the manufacture of iron. The reason was, not that they had not in America sufficient coal, or ore, or limestone, or skilled labour, but because they had not sufficient unskilled labour there, and that he believed, and indeed he hoped, they never would have. They took the labourer as they found him in the mining districts and transplanted him in America, he would not work underground where people could get land for 5s. an acre, and where they could build their own log cabins and

be independent men. That was the reason why America could not compete with England in the manufacture of iron.

Mr. SIEMENS had listened with much pleasure to Mr. Sanderson's elaborate paper, and he had to remark only on one or two points which he thought might lead to misapprehension. Mr. Sanderson stated that 28 cwt. of pig metal produced on an average only 20 cwt. of railway bar, which, in other words, was a loss of 28·6 per cent. of iron; in the processes of puddling and re-heating, in some instances the loss might probably amount to so large a percentage, but at some works with which he (Mr. Siemens) was acquainted, the loss of iron in the puddling furnace did not exceed 12, or occasionally 15 per cent., and a very superior quality of iron was produced without the intermediate process of refining being resorted to. In the course of the last twelve months he (Mr. Siemens) had been engaged upon experiments in the manufacture of iron and steel, and his observations went to prove that the loss of iron sustained in the puddling and re-heating furnaces must be attributed chiefly to the oxidizing action of the flame, which in striking against the iron converted it into slag; by the process which he had adopted (and which had been alluded to lately at this Society, on the occasion of Mr. Clay's paper), he had practically succeeded in reducing the loss sustained in the puddling of crude pig iron to 5 per cent. only, besides which he had obtained other important results, which he expected to bring shortly before the public, but which he would not enlarge upon on the present occasion. He agreed with Mr. Sanderson that not much advantage could be obtained by the use of many of the new plans of converting iron into steel which had of late been proposed, because the actual process of conversion constituted but a very small proportion in the cost of cast steel. The chief expense was incurred in melting the converted steel, the trade price for which was £10 per ton; and improvements should, he thought, chiefly be directed to this point; for machinery purposes the puddled steel by Rieps's process would probably be extensively used, because it was the only known method of producing steel in large masses without necessitating the process of melting.

Mr. HOWELL had listened with great interest to the description given in the paper of the plan of combining iron and steel so as to secure the greater resisting body of the latter in connection with the tenacious quality of the former. He produced to the meeting a specimen of his homogeneous metal, which, he said, was perfectly malleable and possessed all the strength of fused metal, but was free from lamination, combining perfect ductility with the greatest tensile strength. This was a malleable iron, fused in pots and melted in masses sufficiently large for the manufacture of blocks and sheets from one ton to ten tons each in weight, and these were in all respects as sound and as regular as the specimen he now exhibited. The tensile strength of this metal was to be depended upon up to 50 tons per square inch, and when punched there was no liability to shatter. It was in fact cast steel, but without its brittleness. It was pure iron as nearly as it could be made, means being employed to free it from the impurities which were known to exist in bar iron. Mr. Howell mentioned several of the uses to which this homogeneous metal had been applied; amongst others, for multitubular boilers, coupling chains, &c. The little steam-vessel taken out with the expedition of Dr. Livingstone was constructed of this material, the plates being only one-tenth of an inch in thickness, and these were found to be stronger than the ordinary one-eighth plates used in ship building. In reply to an inquiry, Mr. Howell added that the cost of this metal was £50 per ton, but from so much less weight being necessary, the expense was not much greater than that of the ordinary plates.

Mr. ANDERSON expressed his obligations to Mr. Sanderson for his valuable paper, and would refer to one or two points in which he felt an interest. One was the comparative merits of hot and cold blast iron. On the

crystallized metal. He observed that, when this metal, used at so low a cost, was used in the puddling furnace, malleable iron was turned out, of a very superior quality and with an extremely small waste, thereby giving a considerable economy to the iron maker, and of the standard quality of his finished materials. Davies had observed that, owing to the orders which he gave for rails, the makers were compelled to produce them of an extremely low quality, adding, they were not iron, but a miscellaneous compound. Mr. Sanderson fully agreed, and that squeezers were the worst things which could be used in a work of this quality was looked for. He quite agreed in the advocacy of using better rails, and thought it to be to the advantage of other companies of the North Eastern to lay down a superfluity of rails, which, although expensive at first, would be economical in the end. With regard to the objection which had been raised to the utilisation of the apparatus, he stated that danger might arise from want of attention to the apparatus, thereby subjecting it to explosion, just as much as a steam-boiler would be allowed to become dry. With reference to Mr. Sanderson's remarks, he (Mr. Sanderson) fully concurred in the opinion of that gentleman's metal, and compared it to Mr. Sanderson's metal, which was a compound of steel, the latter being so much cheaper an article it would be made useful for many engineering purposes, which Mr. Howell's metal would be too expensive. Mr. Sanderson said that there were still observations of Siemens', Mr. Winkworth's, Mr. Hobbs', and others which he should have liked to reply, but the time of the hour prevented him from so doing, and he closed by thanking the meeting for the attention they had given to his paper.

The Secretary announced that on Wednesday next, the 12th inst, a Paper by Professor Wilson, on "Canada: its Productions and Resources," would be read.

The following letter has been received by the Secretary of the meeting:—

Mr. Sanderson, in his paper, has brought forward a proposition for the employment of a light combined iron rail, which is of great importance if it can be put into effect. Up to this time the progress of the railway in India has been withheld by the Indian Government, on the ground that the amount of shipping required for the cheap freight of rails is only sufficient to the prosecution of the main lines of railway, thereby causing a very great rise in freights, and thereby increasing the cost of the railways. On this ground sanction is not given to many valuable trunk and branch lines, the construction of which would be of the greatest value to the country. If, therefore, a rail could be laid down of equal strength, but of half the weight, the consequence will be a great saving in the present amount of freight to India will be effected for the supply of rails for double the length of time in process of execution.

I am, &c.,

HYDE CLARKE.

10, Bengal Railway, 42, Basinghall-street,
24th May, 1868.

SOUTH KENSINGTON MUSEUM.

During the week ending 1st May, 1868, the visitors have been as follows:—On Monday, Tuesday, and Wednesday (free days), 4,691; on Monday and Tuesday evenings, 4,863. On the three Students' days (admission to the public 6d.), 1,199; one Students' day, Wednesday, 173. Total, 10,816.

Proceedings of Institutions.

BEDFORD.—The twelfth annual meeting of the Literary and Scientific Institution was recently held in the reading-room. William Blower, Esq., vice-president, in the chair; who, after a brief introductory speech, called on Mr. Coombs, the hon. secretary, to read the report. The treasurer's account showed that, during the past year, the income had amounted to £86 10s. 7d.; the expenditure, for the same period, to £83 12s. 5d.; leaving a balance in the treasurer's hands of £2 18s. 2d. Notwithstanding that several other Institutions with similar aims and objects have been formed, the committee report considerable additions to the library, which now contains upwards of 2,000 well-selected volumes of the best writings in the various departments of science and general literature. Lectures have been delivered by Dr. Letheby (in continuation of his former lecture on "Chemical Magic," and by George Dawson, Esq., M.A., on "The Origin, Character, and Doings of the Anglo-Saxons." Communications have been received from the Council of the Society of Arts, in reference to the Examinations for the Prizes and Certificates of the Society, and it has been suggested to the committee that a Local Board of Examiners be appointed in Bedford to act for the district of which it is the centre. The best attention of the committee will be given to this subject, and the fullest information thereon communicated in due course to the members. The vice-presidents, treasurers, secretary, librarian, auditors, and the four retiring members of the committee, were unanimously re-elected. The formation of a Local Board of Examiners for conducting the "previous Examination" of the Society of Arts for its Prizes and Certificates, as referred to in the report, was considered. A discussion ensued on the merits of the proposed Examinations, Prizes, and Certificates, and of the value of the Institution's connection with the Society of Arts, when it was resolved—"That a Local Board of Examiners be formed in accordance with the plan of the Society of Arts."

BIRMINGHAM.—A valuable collection of recent shells, British and foreign, has been presented to the Midland Institute, by Mrs. Taylor, late of Mosley Hall. They are well arranged and in excellent condition, and will form an important addition to the existing collection.

MEETINGS FOR THE ENSUING WEEK.

- MON.** Geographical, 8½. I. Mr. James S. Wilson, "Notes on his Journey in North-west Australia." (Communicated by Sir Frederick Murchison.) II. Dr. H. Barth, "General Historical View of the State of Human Society in Northern Central Africa."
- TUES.** Royal Inst., 3. Mr. J. P. Locatelli, "On the History of Italy during the Middle Ages." Syro-Egyptian, 7½. Mr. Sharpe, "On the Gnostic Gospels and Opinions of the second century of our Era." Civil Engineers, 8. Mr. A. Gilles, M. Inst. C.E., "On the Construction of the Southampton Docks." Med. and Chirurgical, 8½. Zoological, 9.
- WED.** Literary Fund, 3. Society of Arts, 8. Prof. John Wilson, "On Canada: its Productions and Resources." Geological, 3. I. Mr. G. Poulett Scrope, "On Lamination and Cleavage, caused by the Mutual Friction of the Particles of Rocks while in Irregular Motion." II. Prof. Harkness, "On Jointings, and on the Dolomites of Cork." Graphic, 8. Archaeological Assoc., 8.
- THURS.** Antiquaries, 8.
- FRI.** United Service Inst., 3. Major Griffiths, "On Field Fortification." Royal Inst., 8½. Mr. Henry Bradbury, "On Printing: its Dawn, Day, and Decline." SAT. Adiatric, 2. Anniversary. Royal Inst., 3. Dr. Lankester, "On the Vegetable Kingdom in its relations to the life of man." Medical, 8.

point of strength, he believed it had been proved that both descriptions were pretty nearly equal, and therefore he thought the question did not so much depend upon the nature of the blast as upon the quality of the ore and fuel. Mr. Sanderson had stated that the strength of iron was in proportion to its freedom from earthy matters, from which it would be inferred that he meant that iron of the greatest specific gravity possessed the greatest tenacity. The experiments which had been made did not bear out this view. Reference had been made to the probability of making effective ordnance with wrought iron. Although one splendid specimen of manufacture of that description had been made at the Mersey works, under Mr. Clay, yet he did not think much was to be said as to the likelihood of wrought iron ordnance being employed to any extent. An immense effort had been made to manufacture wrought-iron plates of great thickness, for the purpose of floating batteries, so as to render them shot and shell proof; but, although plates had been turned out 8 or 9 inches thick, yet they failed to afford effectual resistance to these missiles. He thought they might look with some hope to the metal introduced by Mr. Howell as affording a valuable material for ordnance; or to some combination of pure iron with carbon, so as to get a material that could be cast in a mass suitable for cannon. Mr. Sanderson expressed a high opinion of the value of Mr. Howell's homogeneous metal, for machinery that was intended for exportation to long distances, and where a large amount of wear and tear was expected. This, he said, had been exemplified in the case of some boilers sent to Russia. He begged to express his cordial concurrence with the concluding remarks of the paper as to the interest which employers ought to feel in the social condition of those in their service; and he believed that any measures in that direction benefited the employer and the employed.

Mr. PEARSALL thought Mr. Sanderson had remarked upon the utilisation of the heat from the blast furnaces in a disparaging tone, yet science had fully proved, and practice had shown, that 80 per cent. of the heat was not employed in the conversion of the iron. It had been stated that at the Ebbw Vale works plans for rendering this surplus heat available were in constant operation. Why, then, were they not more generally adopted? It was true that there were circumstances which threw difficulties in the way. He himself had witnessed a fearful explosion, which had resulted from an attempt to carry out this system in large ironworks, and it was not surprising that this had excited considerable prejudice, though, by judicious management, such accidents might no doubt be avoided.

Mr. WINKWORTH rose to ask, whether "iron and steel united in a bloom, and subsequently rolled to a sheet," and otherwise prepared for the purpose, as explained in the paper, had ever been introduced in ship-building, tubular bridges, or in the construction of railways. If, from the superior quality of the material so prepared, the quantity required for a given purpose was less than that of the article generally used, the higher price of the materials might be thus neutralized. He had also to congratulate Mr. Sanderson on the clear economical views with which he had closed his very interesting paper. It was surprising that a country, so intelligent generally as France, should still adhere to a policy so suicidal as that of protection—falsely so called. It was well known that the Emperor was friendly to freedom of commercial intercourse, and his hands would be largely strengthened, if, instead of criticising modes of government, with which the people of France only were concerned, we addressed ourselves to the propagation, especially amongst the work-people, of those principles of international mercantile policy, which would afford, in their development, the largest material comfort.

Mr. HOWES remarked in reference to the subject of trade, that he had recently imported machinery from

United States in pay a duty of 10

Mr. DAVIES a Pearsall, that would be found the furnace was not see such a thing being generated furnaces.

The CHAIRMAN Sanderson for his paper had been had given rise, it had been of an could not allow alluding to the of this country. He aware that up to imported rather materials, and y year the exports enormous sum of second only to they remember within the short and amazement could only hope ducted with a d masses of the pe It was marvellous of the iron trad from time to the manufacture. It the iron railing factured within Kent and Sussex generations, the was a curious f directed by Mr were most quite found in close p coal, and the li With reference t ture of iron, he seventeenth cent any great extent only in the begi be extensively u Shropshire. Th thought, in its plication of scie the only means we had obtained tion and manuf struggle that to all important th pliances we pos siderations to w this subject had

A vote of tha Mr. SANDERSON to the refined o duced for five sh the puddling fu the trade. He of the cost of th not, where the e exceed the cost from a

[illegible]

AMENDMENT ACT.

INVENTIONS WHICH ARE NOT ALLOWED.

APRIL 30, 1883.]

APRIL 1883.

Improved apparatus for ex-

other like inventions.

APRIL 1883.

Paris—Divers anti-nitrous

similar apparatus.

APRIL 1883.

in machinery or appa-

APRIL 1883.

imp. in purifying alkaline

APRIL 1883.

the joining of earthenware pipes

at various wire conductors, also suitable

APRIL 1883.

improved mode of manu-

APRIL 1883.

in turning bracks and other articles,

APRIL 1883.

and E. Rolland, 21,

in the manufacture of car-

APRIL 1883.

Legent-street—A new appa-

for warming them to the degree

APRIL 1883.

imp. in machinery for

in the manufacture of iron ships.

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389. C. Mather, Salford Iron Works, Salford, and H. Charles, Blackfriars-street, Manchester—Imp. in apparatus for drying cotton, linen, wool, yarn, cord, and other articles.

311. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in sewing machines. (A com.)

313. A. F. Newton, 66, Chancery-lane—Imp. in safety pumps. (A com.)

Dated 18th April, 1883.

315. F. Preston and W. McGregor, Manchester—Imp. in machinery for forging and cutting files.

317. L. Cowell, Adelphi—An instrument or supports for cutting wire, corded, or like fastenings of corded button.

319. W. Spence, 50, Chancery-lane—Imp. in the pedestals and internal boxes of railway carriages. (A com.)

321. J. Harris, Woodside, and T. S. Somers, Houghton-le-Skerne near Darlington—An imp. in railway chairs.

Dated 18th April, 1883.

323. J. Boost, Manchester—Imp. in machinery or apparatus for making labels.

325. P. Brotherhood, Chippenham—Imp. in the construction of locomotive and other steam boilers.

327. G. Walker, Edgaston, Warwickshire—An improved apparatus for cleaning and polishing knives and forks, boots and shoes, and which said apparatus is also applicable for sharpening knives and sharpening or cleaning other articles.

329. A. P. Price, Margate—Imp. in obtaining emulsion, and other compounds thereof.

331. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in preparing printing surfaces. (A com.)

Dated 11th April, 1883.

333. E. F. Sans, Epernay (Marne), France—Apparatus serving measure upon a large scale the smallest provisions of various matters.

335. A. A. Luteran, Paris—The purpose, by machinery, to be wholly or partly leather paper hanging, and all other stuff, that is to say, that a piece can be polished in some parts, having spaces unpolished.

337. D. Chalmers and J. T. Swallow, Manchester—Imp. in boots.

339. J. E. Chirm, junr., Birmingham—A new or improved steam pot or top.

345. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in sewing machines. (A com.)

347. W. Latham, Russell-court, Drury-lane—Imp. in the manufacture of hats and caps.

Dated 19th April, 1883.

349. M. B. Westhead and H. Baines, Manchester—Certain machinery or apparatus for the prevention of accidents applicable to hoisting and other lifting machines employed in connection with railways or other places where heavy loads require to be moved from one level to another.

351. W. H. Ridgway, East View-place, Haxley, Staffordshire—Improved apparatus for opening the covers of jugs.

353. J. Howorth, Farnworth—Improved apparatus for the discharge of smoke and prevent its return, which said apparatus is also applicable for the ventilation of buildings.

355. M. Henry, 77, Fleet-street—Imp. in the manufacture of cord and in preparing materials for the same, and in apparatus employed therein. (A com.)

357. E. K. Calver, Sunderland—Imp. in the formation of barrels of refuge, which improvements are also applicable as a screen in other situations.

359. W. Clark, 53, Chancery-lane—A new instrument for measuring the altitude of the sun, to be termed the "Helioscope." (A com.)

WEEKLY LIST OF PATENTS SEALED.

2758. W. Shields.	3194. P. W. Barlow.
2760. J. Davy and W. Bentley.	122. W. Well.
2764. M. Stodart.	437. W. Thomas.
2784. J. Appery & W. Clissold.	438. Map.
2786. J. Maillon, junr.	2816. R. K. A. Robinson.
2793. R. Wapenstein.	2821. H. Baines.
2796. J. Seltham.	2822. J. Fardred.
2806. J. Miller.	2842. J. Harrington.
2806. G. R. and D. C. Simpson.	2844. I. Taylor.
2814. H. Betanauer.	2864. W. Fickling.
2814. H. R. Palmer.	2825. G. J. B. Baines.
2817. G. Casouil.	2977. C. Goodwin.
2824. J. Adams.	3095. J. J. Davis.
2824. W. J. Elvira.	3096. J. Lang.
2841. H. and S. Thompson.	13. G. E. Cuckley.
2864. M. Henry.	136. G. E. Cuckley.
2908. D. Melvin.	361. W. McLaughlin.
3043. C. Westendary, junr.	416. W. H. Shadman.
	507. L. F. Corbail.

PATENTS ON WHICH THE STAMP DUTY OF TWO SHILLINGS HAS BEEN PAID.

1133. F. W. Mowbray.	975. W. Sharkey.
943. J. March.	994. H. L. Jones, & J. L.
974. F. Dégiorre.	998. H. Baines.
994. F. W. Harrold.	999. W. B. Jones, & H. Jones.
994. J. Lescage & R. Thiers.	and J. Baines.
	May 1st.
	994. H. A. C. Baines.

Journal of the Society of Arts.

FRIDAY, MAY 14, 1858.

CONVERSAZIONE.

The second Conversazione of the present session was held at the South Kensington Museum, on Saturday evening, the 8th inst.

The following divisions of the Museum were open on this occasion :—

1. The Sheepshanks Gallery of Pictures.
2. The Sculpture Gallery.
3. The Architectural Museum.
4. The Animal Produce Collections.
5. The Ornamental Art Collections.
6. The Structure and Building Materials Collections.
7. The Educational Collections.
8. The Collection of Patented Inventions (by permission of the Commissioners of Patents).
9. The Photographic Society's Exhibition (by permission of the Council of the Photographic Society).
10. The Art Training Schools.

The following objects were exhibited to the public for the first time :—

1. A Model, showing the Campaign before Sebastopol, executed by Col. Hamilton, C.B., Grenadier Guards, at the suggestion of his Royal Highness the Prince Consort, at the United Service Institution.
2. Statue of Venus, by J. Gibson, R.A., and the statue of the "Duchess of Burgundy distributing Alms," by Leys (the celebrated Belgian artist), kindly sent by Matthew Uselli, Esq., a member of the Society.

The guests were received on entering by the Council of the Society.

The band of the 1st Life Guards attended.

The number of members and their friends present amounted to 2,280.

The Council desire to express the thanks of the Society to "A Friend of the Society," who, without stating his name, has kindly defrayed the expenses of the attendance of the Band of the 1st Life Guards at the Conversazione on Saturday last.

LOCAL BOARDS—PREVIOUS EXAMINATION.

Fifty-four Local Boards have been formed. Returns of the Candidates who have passed the previous Examination have been received, as follows :—

Louth	4
Wigan	6
West Hartlepool	3
Leeds (Christian Institute), No. 1.	14
Northowram	1
Portsmouth	2
Warminster	1
Banbury	2
Macclesfield	29
Newcastle-on-Tyne	3
Leamington	1
West Brompton	4
Leeds, No. 2.	10
Wakefield	4

Pembroke Dock	4
Ipswich	6
London Mechanics' Institution	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	18
Halifax, No. 1.	15
Salisbury	1
Liverpool	35
Lockwood	1
Halifax (Working Men's College), No. 2.	21
York	7
Berkhamstead	19
Bristol	11
London Domestic Mission	1
Royal Polytechnic Institution	28
Birmingham, No. 1, (Messrs. Chance's Reading Room)	2
Sheerness	1
Sheffield (People's College), No. 1.	15
Sheffield (Mechanics' Institution), No. 2.	3
Blackburn	5
Crosby Hall (London) Evening Classes.	19
Windsor and Eton	10
Greenwich	1

The total number of Candidates who have been examined by the Local Boards, is 1,098.

EXAMINATION PRIZE FUND FOR 1858.

The following is a list of Donations up to the present date :—

T. D. Acland, Member of Council	£ 5 5
The Rt. Hon. C. B. Adderley, M.P.	5 0
John Ames	5 5
J. G. Appold, F.R.S., Auditor	10 10
John Ball	5 5
T. H. Bastard	5 0
Messrs. Chance, Brothers	10 10
R. L. Chance	5 5
Harry Chester, Vice-Pres.	10 10
J. P. Clarke	1 1
G. Clowes	10 10
Henry Cole, C.B., Vice-Pres.	1 0
H. D. Cunningham, R.N.	1 1
C. Wentworth Dilke, Vice-Pres. Chairman of Council (third donation)	10 10
Thomas Dixon	1 1
Lieut.-Col. F. Eardley Wilmot, R.A.	5 0
Viscount Ebrington, M.P.	5 0
Lord Ebury	5 0
J. Griffith Frith, Member of Council	5 5
J. W. Gilbert, F.R.S., Treasurer (second donation)	10 10
F. Seymour Haden (annual)	2 2
William Hawksworth	1 1
Edward Highton (annual)	2 2
James Holmes (annual)	1 1
The Marquis of Lansdowne, Vice-Pres.	20 0
George Lowe, F.R.S.	1 1
The Master of the Mint, Member of Council (second donation)	10 10
George Moffatt, M.P., Vice-Pres.	10 10
Lieut.-General Sir Charles Pasley, K.C.B.	5 0
Sir Thomas Phillips, Member of Council ...	5 5
William T. Radford	1 1
Charles Ratcliff, Hon. Local Sec. (annual) ...	10 10
Joseph Skrey, M.D.	1 0
William Tooke, F.R.S., Vice-Pres.	10 10
Arthur Trevelyan	1 0
T. Twining, jun., Vice-Pres.	10 10
Dr. J. Forbes Watson	1 1
G. F. Wilson, F.R.S., Member of Council (third donation)	10 10

EXAMINATIONS.—PRIZES FOR 1858.

The following Prizes are offered to the Candidates, viz. :—

One First Prize of £5, and one Second Prize of £3 in each of the 26 subdivisions of the subjects of Examination.

No Prize in any subject will be awarded to a Candidate who does not obtain a Certificate of the first class therein.

The Prizes will be given in money or in books, at the option of the Candidate.

The following Prizes are offered to the Local Boards, viz. :—

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than ten) bear the largest proportion to its whole number of Candidates.

—One Prize of £10.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than eight) bear the largest proportion to its whole number of Candidates.

—One Prize of £8.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than six) bear the largest proportion to its whole number of Candidates.

—One Prize of £6.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than four) bear the largest proportion to its whole number of Candidates.

—One Prize of £4.

No Local Board can receive more than one of these Prizes.

These sums may be applied by the Local Boards to the payment of the expenses of the Examination, or otherwise, as the Board may deem best, for the promotion of the objects for which it was instituted.

EXAMINATIONS.

The following Letter of Instructions has been issued to the Local Boards :—

Society of Arts, John-street, Adelphi, London, W.C.
12th May, 1858.

SIR,—I am directed by the Council of the Society of Arts to inform you that the papers for the ensuing Examination of Candidates for the Society's Certificates will be forwarded by post, on Friday, the 21st of May, in a parcel addressed to you at

You will have the goodness to let me know by telegraph on Saturday, the 22nd, in time for the despatch of duplicate papers by that evening's post, if the parcel is not duly delivered to you in the morning of that day.

The papers in each subject will reach you in a separate envelope, the seal of which is to be broken, in the presence of the assembled Candidates, at the commencement of the time appointed for that subject in the Time-table. This direction, as well as the order and hours of Examination laid down in the Time-table, must be strictly observed. It is absolutely necessary, for the proper working and ultimate success of these Examinations, that there should not be the very least suspicion as to the perfect fairness and equality with which they are conducted at all the different centres; and such suspicions can only be obviated by the simultaneous employment of the same set of papers at each centre. On this, and on the firmness and fidelity with which the members of the Local Boards discharge the simple, though somewhat onerous, duties required of them to prevent the possibility of any dishonest dealing on the part of the Candidates while under examination, the whole success of the present scheme depends.

I am, therefore, to invite your most careful attention to the "Advice to Candidates," which you will find printed at the foot of the enclosed copies of the Time-table, and to the terms of the accompanying Declaration, one of which forms will have to be filled up and returned to me, after it has been signed by at least two members of the Local Board, at the end of each meeting of the Candidates. To provide for this it will be necessary that you should immediately make arrangements with your colleagues on the Local Board, to secure the attendance of a sufficient number of them in rotation at the different periods of the Examination. The attention of your Candidates should be drawn to the Time-table now sent to you, and copies of it should be suspended in the Examination Room.

It will further be necessary that the Local Board should provide writing paper, of foolscap size, scribbling-paper for rough drafts, and blotting-paper for the use of the Candidates, who should be desired to bring their own pens and a small inkstand to the examination room, but nothing else. They should be required, on entering the examination room, to give up all books, papers, memoranda, writing-books, or loose blotting-paper, which they may have brought with them, under the penalty of immediate exclusion from the Examination if any such articles should thereafter be found in their possession. After such notice, the plea of accident or forgetfulness cannot be admitted.

The only exception to this regulation is in the case of the Candidates who take the exercises in Mechanical Drawing, and who should be allowed to bring with them a case of Mathematical Instruments.

Stationery should be supplied to each Candidate, at the rate of three sheets of foolscap, and one of scribbling-paper, for every Paper which he works, together with one sheet of blotting-paper, which should serve for the whole of the Examination. Ruled paper will be forwarded for the use of the Candidates who are to be examined in Book-keeping.

The Time-table has been drawn up to meet the general convenience of the whole number of Candidates who will meet at the different centres. If any one, among those who are examined under your superintendence, wishes to work two Papers which are fixed for the same hour, he should be strongly recommended to confine himself to one of them; and to bear in mind that, while one high certificate is of more value than two low ones, he will have an opportunity, next year, of being examined in the subject which he omits on the present occasion.

The Candidates should sit, in the order of their numbers, as far apart from each other as the space at your command will allow. If you cannot spread them out so as to prevent the possibility of communications passing between them, it will be well, when two or more papers are worked at the same time, to arrange alternately the Candidates who take different subjects.

Three hours only are allowed for each paper, except in the case of the exercises in Drawing, for which four hours may be taken.

All writing must cease at the end of the three hours, to a moment; and, if there is no clock in the room, it may be well to give notice to the Candidates when one and two hours have elapsed, and again when they are within ten minutes of the end of each sitting.

The Candidates should leave their answers at their seats (with the Examination papers attached to them), after having carefully filed them all together in order through the upper left-hand corner. A supply of green silk twist and some large needles should be procured for this purpose.

The papers should then be collected—those on each subject separately—and arranged in the order of the Candidates' numbers. After a separate Declaration has been filled up and signed, in reference to the papers on each subject, it should be tied up with them; and the

should be forwarded by post (if the numbers are parcel addressed to me) the cover stating the number which it contains. The day on which each is to be forwarded, to announce the despatching, (1) The number which it contains, and (2) by post or rail.

To saddle you with the directions, but, as it is the duty of particulars which, on the scale of that now to rectify any serious misapprehension of every one engaged in carrying out the details,

Excellent Servant,
LE NEVE FOSTER,
SECRETARY.

TABLE.

will be held on the 24th, 25th, and 26th of May. The examination will be from nine in the morning to five in the afternoon, and evening.* Candidates may be admitted after the Examination is closed.

12	2 o'clock to 5 o'clock.	6 o'clock to 9 o'clock.
	Algebra. Magnetism, Electricity and Heat.	Arithmetic.
	Geometry. Physiology.	Book-keeping. Trigonometry. Latin and Roman History.
		Mechanical Drawing. (From 5 o'clock to 9 o'clock.)
	German. Conic Sections. Agriculture.	French. Political and Social Economy. Chemistry. Mensuration.
		Descriptive Geography. Botany. Statics, Dynamics, & Hydrostatics.
		English Literature. Physical Geography, including Geology. Astronomy.

ADVICE TO CANDIDATES.

Read the Time-table carefully, and note the subjects for the subjects in which you wish to be examined at your seat in the Examination Room. Note the hour appointed for each Paper which you are to write.

When a Paper is given to you, first look at the instructions at the head of it, and then read the questions carefully over, marking those which you think you can answer best. Do them first, and if any time remains, you may try some of the others, but do not exceed the number of questions appointed to be answered. Remember that a few accurate and sensible answers will gain a higher number of marks than a great number of indifferent attempts.

*These of Free-hand Drawing and Mechanical Drawing each of these subjects four hours will be allowed.

3. No Candidate will be allowed to resume the working of a Paper after he has once left the room in the course of the time appointed for that Paper.

4. If a Candidate has any question to ask, or wants anything in the course of the Examination, he should not leave his place; but *should stand up and call out his number*, when some one will attend to him.

5. As soon as notice is given (10 minutes before the end of the time) finish your Papers, see that they are numbered rightly, and in their proper order, and leave them UNFOLDED at your seat.

CAUTION.

6. No Candidate may speak to another Candidate, on any pretence whatever, under pain of immediate expulsion.

7. Any Candidate detected in taking unfair advantages, such as referring to any Book, or Written Paper, or in seeking assistance from another, will be subject to the same penalty.

8. Whoever gives assistance will be treated in the same manner as he who asks for it.

9. Stationery, including Blotting-paper and Drawing-paper, will be furnished for the use of the Candidates. No one can bring anything into the Room with him, except an inkstand and a supply of such pens as he is in the habit of using.

DECLARATION.

Local Board of _____

We, the undersigned, hereby declare that the _____ papers on _____ which are forwarded herewith, were worked, in our presence, by the Candidates whose numbers they respectively bear, without any assistance whatever, from books, notes, memoranda, from each other, or from any other person. We declare that not more than three hours were occupied in working these papers, and that no Candidate was allowed to resume, or complete, his paper after having left the Examination room in the course of the time assigned to that paper; We further declare that the paper of questions given to each Candidate was taken from the envelope in which it was transmitted from the Society of Arts, the seal of this envelope being broken in our presence, and in that of the assembled Candidates, at the commencement of the time appointed for the paper in the time table issued by the Society; and, finally, we declare that not fewer than _____ of our number were present during the whole time that the Candidates were engaged in these papers.

Name, designation, and address of members of Local Board who were present during the working of the papers referred to in the above declaration.†

(a) Insert Number.

(b) Insert Subject.

* State the number, which in no case must be less than two.

† This declaration must be signed, in every case, by, at least, two of the members of the Local Board; and, when more than twenty Candidates are examined at any one sitting, by, at least, three such members. It must not, in any case, be signed by a member of the Board from whom any of the Candidates have received instruction in the subject of the paper to which it refers.

BOARD OF EXAMINERS.

The following is a list of the Board of Examiners for the present year:—

Arithmetic.....	{ Rev. Alexander Wilson, M.A., National Society, London.
Book-keeping.....	{ John Ball, Esq., of the firm of Messrs. Quilter and Ball.

MATHEMATICS.

Algebra	{ Rev. Harvey Goodwin, M.A., Cambridge.
Geometry	{ Rev. B. Morgan Cowie, M.A., Professor of Geometry at Gresham College; one of H.M. Inspectors of Schools.
Mensuration	{ William Spottiswoode, Esq., F.R.S.
Trigonometry	{ Rev. Bartholomew Price, M.A., F.R.S., Sedleian Pro- fessor of Natural Philosophy in the University of Oxford.
Conic Sections	

PHYSICS.

Navigation and Nautical Astronomy	{ John Riddle, Esq., F.R.A.S., Head Master of the Nauti- cal Schools, Greenwich.
Statics, Dynamics, Hy- drostatics	{ Rev. A. Bath Power, M.A., Principal of the Diocesan Training School, Norwich.
Practical Mechanics	{ T. M. Goodeve, Esq., Profes- sor of Natural Philosophy, King's College, London.
Magnetism, Electricity, and Heat.. ..	{ Charles Brooke, Esq., M.A., F.R.S., Surgeon to the West- minster Hospital.
Astronomy	{ Rev. Baden Powell, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford.
Chemistry	{ Dr. A. W. Williamson, Pro- fessor of Chemistry, Univer- sity College, London.
Animal Physiology	{ William Sharpey, Esq., M.D., F.R.S., Examiner in Uni- versity College, London.
Botany	{ Arthur Hensley, Esq., F.R.S., Professor of Botany, King's College, London.
Agriculture	{ J. C. Morton, Esq.
Political and Social Eco- nomy	{ Charles Neate, Esq., M.A., Professor of Political Eco- nomy in the University of Oxford.
Descriptive Geography...	{ Wm. Hughes, Esq., F.R.G.S.
Physical Geography	{ Rev. Samuel Clark, M.A., F.R.G.S., Principal of the Training College, Battersea. <i>Chairman of the Board.</i>
English History.....	{ E. S. Creasy, Esq., M.A., Professor of History, Uni- versity College, London.
English Literature	{ Rev. F. Temple, M.A., Head Master of Rugby School.
Latin and Roman History	{ F. R. Sandford, Esq., B.A., Assistant Secretary to the Committee of Council on Education.

French.....	{ Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.
German	{ Dr. Bernays, Professor of German, King's College, London.
Freehand Drawing	{ F. S. Cary, Esq.
Mechanical Drawing.....	{ Thomas Bradley, Esq., Pro- fessor of Geometrical Draw- ing, King's College, London, and Master at the Royal Military Academy, Wool- wich.

TWENTY-SECOND ORDINARY MEETING.

WEDNESDAY, MAY 12, 1858.

The Twenty-Second Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 12th inst., William Brown, Esq., M.P., Vice-President, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Baylis, Charles	Quain, Richard, M.D.
Heywood, James	Watts, William Henry

The CHAIRMAN said we must all feel much indebted to gentlemen who undertook the duty of travelling for the purpose of enlightening those who remained at home, and who, by the publication of their observations and researches, made us acquainted with countries in which we could not but feel the deepest interest, and who gave us an account of the climate, scenery, productions, population, social condition, and, above all, healthfulness and general adaptation for the settlement of European emigrants, of our colonial possessions. In this respect, therefore, we were greatly indebted to Professor Wilson for having undertaken to read a paper on the subject of Canada, which he was sure would be listened to with great interest. He would, therefore, without occupying the time of the meeting further, call upon Professor Wilson to favour them by reading his paper.

The Paper read was—

ON CANADA—ITS PRODUCTIONS AND RESOURCES.

By PROFESSOR JOHN WILSON, F.R.S.E.

There are three important epochs in the history of Canada. In the year 1694, Philip Chabot, Vice-Admiral of France, with his able and enterprising lieutenant, Jacques Cartier, sailed into the Gulf of St. Lawrence, and, hoisting his flag on the mainland, took possession of it, in the name of his country.

In 1760, the fierce and bloody struggle, which had been carried on with intermissions and varying success between the North American colonies of France and England for upwards of eighty years, was finally decided upon the heights of Quebec, by that glorious and ever-memorable battle, in which the rival commanders, Wolfe and Montcalm, both fell—the lifeblood of the one ebbing fast as the shouts of victory reached his ears—while the other's spirit had happily passed away, while the victory was yet uncertain, and the pangs of a defeat unknown. From this time the French rule in Canada ceased, for in the following year a formal deed of capitulation ceded to England the right to all her North American possessions;—and New-France, as they were termed, ceased, from that time, to be a dependency of the French crown.

In 1861, when Industry received her great ovation in Hyde-park, and all the civilized countries of the world were assembled under one roof—few representative collections excited more gratification, and none more surprise, to the observant visitor, than that which was displayed under the banner of youthful Canada. To many, it is true, it possessed not the attractions of the luxurious though barbarian East—it attempted no rivalry with the high class industry of older countries; the gorgeous gems and highly-wrought minerals of Russia—the magnificent exponents of France's high civilization—the more solid, though still equally advanced, manufactures of Central Europe, were none of them included in her collection. In the place of these luxuries of life, we found its necessities, its stern realities, forming the main object of her display. Some few manufactures, either special to the country, or sufficient to show its progressing condition, were, it is true, exhibited, but the great feature of the collection, that which invested it with such general interest, was the magnificent display of "raw produce," which showed, beyond a doubt, the value and vast industrial resources of a country, whose loss to its former possessor occasioned only the consolatory remark, by the Minister of the day (M. de Choiseul-Stainville), "After all, what signify a few acres of snow in Canada."

The success achieved in Hyde-park, in 1861, was even exceeded in Paris, in 1855, when Canada, an independent and self-exhibiting colony of Great Britain, sustained a successful rivalry with Algeria, the favoured colony of France, varied and admirable though her contributions were, and displayed with all the acknowledged taste and great resources of the Imperial Government. Then it was, in the capital of her ancient mistresses, that the contrast between the past and the present state of Canada first most forcibly presented itself, and drew from the lips of Count Jaubert, when examining the magnificent representations of her agriculture, that expression of regret, mingled with admiration, "Now we can indeed form an estimate of the value of those few acres of snow ceded to England with such culpable negligence by the Government of Louis XV." Richly did the collection deserve the encomiums universally bestowed upon it, and Canada stands registered in the memory of France under the descriptive title of "A land of hope, not likely to be disappointed. Active, intelligent, enterprising beyond all other distant nations, which equally abound in the elements of industry and production, she claims and demands our attention."

These opinions, expressed publicly and officially—and I could readily multiply them,—surely carry with them points worthy of our consideration at home—where, I believe, the actual condition of Canada is still very imperfectly known, especially by those classes to whom such knowledge would prove of the greatest benefit; and it is principally with a view to afford this information, that I have been invited to give you this evening my impressions of "Canada: its Productions and Resources,"—impressions formed from personal observation, and from data which, from time to time, have been kindly furnished to me.

To give these in the most succinct manner, I propose to divide them under the following heads: history—geological formation and physical geography—natural productions and capabilities—trade statistics—actual social condition, and general considerations. And I can only attempt to give them in the briefest and most condensed form, as the time allowed me is really insufficient to do full justice to either section of my subject.

The only portion of the history of Canada to which I shall make further allusions, will date from the third epoch—that of 1861—when public attention was first drawn to the condition and capabilities of the colony, by her industrial display in Hyde-park, when thousands of

wondering visitors went home and rubbed up their geography anew. In order to be assured of the existence of a country which, under the general name of America, had, by the many, been too generally confounded with the United States. And this portion I can refer to more appropriately when I submit to your consideration the industrial statistics of this progressing country.

GEOLOGY AND PHYSICAL GEOGRAPHY.

That map which hangs on the wall, with its distinctive geological colourings, is, to my mind, most important evidence of the progressing civilization of its country. Thanks to Sir W. E. Logan, the able and indefatigable Director of the Geological Survey of Canada, I have an opportunity not only of showing you how far he has determined the actual geology of the vast country under his charge, but he has also kindly made me acquainted with the results of his preliminary explorations during the past year, which, as they relate more particularly to the surface geology, have a material bearing upon the agricultural capabilities and general settling character of the districts visited. In the ranks of science there are few men whose correctness of observation and judgment and whose opinions are more valued and relied on than those of Sir W. E. Logan.

Prior to the year 1840, Canada was divided into two distinct provinces, known as upper and lower, possessing separate legislative bodies or parliaments for each. In 1840 these provinces were united, although for some purposes the old territorial divisions still exist. The River Ottawa is the division line between the two portions on the north side of the St. Lawrence; and the 45th parallel of latitude on the south side of the river. The entire Province is bound on the north by the British possessions, at present in the hands of the Hudson's Bay Company; on the south and east by the States of the Union, and the British province of North Brunswick. The west boundary, west of Lake Winnipeg, is yet undefined. The great River St. Lawrence and the vast chain of inland lakes—Superior, Huron, Erie, and Ontario—form a wonderful and natural barrier between Canada and the United States, affording at the same time a means of transport and communication of unsurpassed excellence and importance to both.

The area of the Province, without its north-western possessions, is computed at 360,000 square miles; of which about 40,000 only are at present occupied. Its form is that of a parallelogram, stretching south-west and north-east, with an extreme length of about 1,200 miles, by a breadth of 300 miles. The limits of the country extend from the 60th to the 84th degree west long., and from the 42nd to the 52nd deg. parallel of lat.

Throughout the whole of its length the Province is traversed by a mountainous region, dividing it into two basins, which may be distinguished as the north and south basins. This range which has been termed the Laurentides, form the north shore of the St. Lawrence, from the Gulf as far as Cape Tourment, near Quebec, from which point they leave the river, and while they follow its general direction they withdraw from it, until, near Montreal, we find their course to be at a distance of 10 leagues. In a westerly direction the mountain chain follows the course of the Ottawa river, which it crosses near the Lac des Chats, fifty leagues from Montreal; then, taking a turn to the south, it again comes on to the St. Lawrence near the outlet of Lake Ontario, and from this point trending towards the north-west, the south limit of the formation reaches the south-east extremity of Lake Huron at Matchedash Bay, and forms the east shore of the lake as far as the 47th deg. of lat., where it leaves Lake Huron, and running along Lake Superior it stretches out in a north-west direction as far as the Arctic Ocean.

On the south bank of the St. Lawrence this formation is seen occupying an area between the Lakes Champlain and Ontario, where it is known as the Adirondack range. With the exception of the

and possibly a small patch or two in Arkansas, and near the head water of the Mississippi, the formation does not occur south of the St. Lawrence, and from the circumstance of its being developed only in the valley of the St. Lawrence, the general name of Lawrentian has been given to the whole system.

The rocks forming this system are almost always sedimentary strata, which have become highly crystalline. They have been much disturbed and form ranges of hills, in which crystalline schists, of a gneissoid and hornblend character, and crystalline limestones, associated with feldspars predominate. The beds of crystalline limestone form important features in this formation. They occur in beds of from a few feet to 300 feet in thickness, and with them various strata of dolomite and of other limestones of a less compact nature and more or less magnesian are found, which aid greatly their disintegration and formation into soils. This system is equivalent to the gneissoid rocks of Scandinavia and Scotland.

The Huronian (our Cambrian) occurs chiefly on the shore-line of Lakes Huron and Superior, and consists of a series of schists, sandstones, limestones, and conglomerates, interstratified with thick beds of greenstone, largely disturbed by the irruption of trap dykes, and resting unconformably upon the Lawrentian beds.

The Silurian system is also largely developed in Canada, covering the inclined strata of the Cambrians of the island on the north side of the Huron, and lying immediately on the Lawrentian throughout the entire range of their outcrop in the valley of the St. Lawrence; indeed, with the exception of a small area of the Devonian system, the whole of the Canadian portion of that great basin, which is bounded to the north by the Lawrentian and Huron rocks, belongs to this system. The lithological characters of these rocks are the same as with us, alternating beds of shales, sandstones, and limestones of variable compactness, the value and character of the soils formed from them being due to the relative proportion and admixtures of the different beds. The Devonian (with the exception of small patches of the Carboniferous) are the highest or most recent formation met with in Canada, and is only met with at the lower end of Lake Ontario, and at the south-east extremity in the district of Gaspé. These beds generally disintegrate readily, and are looked upon as affording evidence of a fertile surface.

The carboniferous system is unhappily limited in Canada to its least valuable representative, the mountain limestone and the millstone grit, and which, indeed, occur only to a very limited extent. We must go beyond the boundary line of the province for those valuable deposits of coal which the neighbouring provinces of Nova Scotia, New Brunswick, and Newfoundland are so abundantly provided with.

Although coals cannot be reckoned in the rich list of her mineral wealth, well nigh every other production of the rocks is to be found among her stores.

Of *Iron Ores* numerous deposits exist. *Hæmatites* at Marmora, Madoc, Sherbrooke, Bedford.

Spathic Ores—Wallace, Lake Huron, McNab, St. Arnaud, Sutton, Brome.

Bog Ores at Middletown, Charlotteville, Eardley, Templeton, Champlain, Portneuf, Standbridge.

Titaniferous Ores—Vaudreuil, St. Urbain.

Zinc Ores at Prince's Mine, Mamainse (Lake Superior).

Lead Ores at Fitzroy, Lansdowne, Ramsay, Bedford, Maimansee, &c.

Copper Ores and Metallic—Lake Superior, Lake Huron, Inverness, Leeds, Upton (argentiferous), Ascot (containing gold and silver).

Nickel—Michipicoten (Lake Superior), Wallace Mine (Lake Huron), Ham, Bolton.

Silver—Lake Superior, Michipicoten, and Prince's Mine.

Gold—Beauce County, auriferous region in alluvial sands, extending over an area of 10,000 square miles

contained also in the ores of Prince's Mine at Ascot and other places.

Uranium—Yellow oxides at Madoc.

Chromium at Bolton and Ham.

Cobalt—Prince's Mine (Lake Superior).

Manganese—Bolton, Stanstead, Beauce, St. Anne.

Barytes—Bathurst, Mc Nab, Lansdowne.

Graphite—Grenville, Fitzroy.

Lithograph Stone—Marmora, Rama, Lake Couchiching.

Gypsum—Dumfries, Brantford, Oneida, Seneca, &c.

Phosphate of Lime—Ottawa, Burgess, Calumet, Hull.

Millstones—Bolton, and other places in the eastern townships.

Grindstones and Whetstones—Marmora, Madoc, Stanstead, Bolton, Shepton, Marston.

Building Stones—Granites, sandstones, and limestones, are largely distributed all over the country.

Hydraulic Limestones at Point Douglas, Paris, Cayuga, Thorold, Kingston, Hull, Quebec.

Roofing Slates—Kingsey, Halifax, Melbourne, Rivier du Loup.

Paving Stones—Toronto, York, Bagot, Horton, Inverness.

Clays, suitable for bricks and rough pottery, are found everywhere in the valleys of the St. Lawrence, Ottawa, and Richelieu rivers: for finer goods, at London, Toronto, Coburg, Peterborough.

Marbles, various in colour and pure in quality—white, at Philipsburg; black, at Cornwall; red, at St. Lin; brown, at Pakenham; yellow and black, at Dunsdell; grey, &c., at McNab, Montreal, St. Dominique; green, at Grenville, Stukely, Brompton, Oxford.

Peat at Humberstone, Wainsfleet, Goulbourn, and numerous other localities.

Petroleum—on the Thames, River St. Jean, and Ruiseau Argente (Gaspé).

Asphaltum—Enniskillen.

This slight sketch of the mineral produce of the country, so far as at present explored, is, or ought to be, sufficient to show what immense resources can be offered to industrial enterprise when agriculture has occupied her surface and pioneered the way, and few countries can offer more temptation to the occupier of the soil. Although Canada has been denuded of all those secondary and tertiary formations which give such interest to the geology of our own country, the older rocks, which we are accustomed to associate with ideas of a thin, cheerless, and unfertile surface, have been largely covered up by post-tertiary, the most recent of our terrestrial deposits. Here we have both the chemical and physical elements of fertility, and happily these are spread over extensive areas throughout the Province. The greater portion of the surface of the country is occupied by the inter-stratified clays and sands of these deposits, giving, according to their relative admixtures, every variety of texture, and forming soils of great fertility, especially when in contact with the outcrops of the limestones and feldspars of the sub-jacent rocks. In this formation those beds of peat are met with, which, in the absence of coals, and with the decreasing supplies of wood, are already becoming of importance to the district in which they occur.

You have only to run your eye over the map of Canada, and you will see the admirable disposition of land and water throughout the entire extent of the country; the magnificent St. Lawrence, the backbone of the system, with its head waters in Lake Superior and its other extremity in the broad Atlantic, 2000 miles off, is the main link in the chain of Canada's present and future prosperity. Along the waters of this grand river, every district of Canada, aye, and of the mighty "West" too, finds a high road to the ocean—there free to take its produce to the markets that pay the best. Its tributaries, some hardly inferior in importance to itself, stretch right and left into regions where the woodman's axe alone breaks the solitude of the primeval forest, and connect the lakes

and rivers of the interior with the ocean—and with those better known to us, on whose shores man has fixed his abode. Look at the Saguenay, with a tidal range of 10 ft. to a distance of 80 miles from its mouth; the St. Maurice, with a length of some 300 miles; the Richelieu—connecting Lake Champlain with the St. Lawrence; the Ottawa, or Grand River—a river destined to occupy an important page in the future of the country—not only as a rival highway for the commerce of the west, but as possessing on its banks the newly-chosen Capital of Canada.

The enormous fresh water lakes or inland seas are too well known to need more than a passing notice. The first we come to, 756 miles from the sea and 234 feet above its level, is Lake Ontario, 180 miles long and 50 miles wide, with a depth of 190 fathoms, and having a surface area of nearly 6,600 square miles. Then comes Lake Erie, 1,041 miles from the sea, and 564 feet above its level, the difference in level being overcome by the Welland canal, one of the finest specimens of canal engineering in the world. Here we have an expanse of water 240 miles long by 54 miles broad, covering an area of nearly 12,000 square miles. Crossing the small Lake St. Clair, 24 miles long by the same in breadth, we reach Lake Huron, 240 miles long by 90 miles broad, with a surface area of about 18,000 square miles, at a distance of 1,350 miles from the sea, and 573 feet above its level. We now approach Lake Superior, the head waters of the St. Lawrence—a short but stupendous canal, constructed by the United States, connecting the two lakes, and completing the chain of navigation for sea-going vessels 2,000 miles into the interior of the country. The vast expanse of water of this lake, the largest in the world, with a length of 333 miles by 160 miles broad, giving a surface area of 33,000 square miles, is at present the end of the St. Lawrence navigation; but a glance at the map will show you that there are chains of rivers and lakes stretching far out into the north-west which some day will play the same part as those already named have done in the advancement of civilization, and be made subservient to the purposes of man's welfare.

This bountiful distribution of water, and beautifully developed river system, has a broad bearing not only on the general welfare, but upon the very existence of the country. The great and ready powers of transport it affords are as nothing compared with its influence over the climate, the vegetation, and the health of the community. In these we recognise the bounteous provision which gives to the inland portions of the country almost an insular climate, and softens down those extremes of temperature which form such permanent barriers to the migration of the "mighty West."

The two points most affecting climate and vegetation are temperature and rainfall. Let us see what the meteorological records of Her Majesty's Observatory at Toronto tell us. We have a digest of the range of the thermometer for 11 years, from 1840 to 1850 inclusive:—

	Max.	Min.	Range.	Mean.
January	45.88°	4.41°	49.74°	24.67°
February	46.85	4.87	50.72	24.14
March	56.81	7.59	45.92	30.85
April	71.44	17.96	45.48	42.17
May	76.76	26.62	47.94	51.64
June	76.44	35.72	40.72	61.42
July	88.11	44.06	44.06	66.64
August	83.96	45.62	38.95	65.76
September	80.19	32.07	48.12	57.11
October	66.10	22.17	44.30	44.60
November	57.08	13.38	43.60	36.57
December	45.25	3.62	46.27	27.18

Annual Mean, 44.89°.

These data show us that February is the coldest, and July the hottest, month in the year; that there are four months—December, January, February, and March—when the average temperature is below 32°; there are three months—April, October, and November—during which the temperature remains below the mean temperature of the year; and that there are five months—May, June, July, August, and September—when the temperature is above the annual mean, and which constitute the growing season in Canada.

The average rainfall, calculated from the records of a series of years, gives the following results:—

	Days.	Inches.
January	4.6	1.701
February	3.9	1.088
March	5.7	1.613
April	8.7	2.671
May	10.8	2.975
June	10.7	3.042
July	8.9	3.720
August	9.3	2.719
September	10.6	4.458
October	11.3	2.929
November	9.2	3.026
December	5.1	1.522

Thus showing an average rainfall of 31.364 inches occurring on 97.3 days, and distributed nearly equally over the agricultural year.

To this must be added the average snow-fall, which amounts to 61.9 inches per annum. If we compare the extremes of temperature (taking summer and winter means), between Toronto and the Western States of the Union, we find them entirely in favour of Canada.

	Latitude.	Deg.	Min.	Deg.
Canada, at Toronto	43	39	the difference is	39°
Iowa, Muscatine	41	30	"	45°
Illinois, Fort Armstrong	41	28	"	49-05
Wisconsin, Fort Crawford	43	03	"	50-89
Missouri, Council Bluffs	41	45	"	51-34
Minnesota, Fort Snelling	44	53	"	56-60

If we compare the temperature and rainfall with those of this country, we find the equally favourable results, our mean temperature being about 50°, and our average rainfall about 28 inches, occurring on 155 days, showing a slight difference in favour of Canada.

As a proof that this excess, so important to vegetation, is not so high as to be injurious to health, the vital statistics of the province, compared with those of other countries, give satisfactory evidence.

In Turkey, the deaths are to the population as	1	in	30
" Prussia	"	"	1 " 39
" Portugal	"	"	1 " 40
" Spain	"	"	1 " 40
" Switzerland	"	"	1 " 40
" Austria	"	"	1 " 40
" Norway and Sweden	"	"	1 " 41
" France	"	"	1 " 42
" Belgium	"	"	1 " 43
" Russia (Europe)	"	"	1 " 44
" Denmark	"	"	1 " 45
" England	"	"	1 " 46
" United States	"	"	1 " 74
" Canada	"	"	1 " 98
" " (Upper)	"	"	1 " 102
" " (Lower)	"	"	1 " 92

These remarks refer chiefly to Canada West, the meteorology of Canada East not having received the same attention. We know, however, that the ex-

of summer and winter temperature are greater in the valleys of the St. Lawrence and Ottawa than south of the 44 deg. parallel; that though the winter is somewhat longer, the air is clear, dry, and bracing. The snow usually comes on at the beginning of December, and disappears about the middle of April, remaining on the ground three or four weeks longer than in the western part of the province. This snow-fall is looked for with great anxiety, especially in the thinly-settled districts, as it furnishes a natural railroad for transport and traffic, which, in a new country, where roads are necessarily few and imperfect, is of great importance. As the country becomes cleared and inhabited, the snowfall gradually diminishes, thus appearing to obey the laws of civilisation, subserving to the wants of the settler in the early days of his necessities, and urging him to other resources as his age advances and his powers increase.

PRODUCTIONS AND GENERAL STATISTICS.

I must content myself with this brief sketch of the geological and physical geography of the country, and now tell you something of its productions, which include within their wide range well nigh all the necessities and most of the comforts of life. These I may divide under three heads: the produce of the Mine—the Forest—and the Field, in each of which the present returns give good evidence of what the future will be when the country is more advanced and its vast resources more developed.

In all new countries, the productions of the surface are of more importance to the settler than those beneath it, and the undue development of its mineral wealth rarely indicates a healthy condition. In Canada, although there is ample evidence of the existence of this wealth, the energies of the people, happily, have been directed to other productions, and this branch of industry remains well-nigh intact for future enterprise. By the trade statistics, we find that the following amounts represent the mineral exports:—1853, £27,339 3s. 2d.; 1854, £74,730 18s. 1d.; 1855, £31,458 15s. 8d.; 1856, £41,411 15s. 8d.; the greater proportion of which is from the Lake Huron copper mines.

The productions of the Forest are more numerous and more important. Of course, timber in its varied shapes is the principal item, potashes and peltry furnishing the other amounts. These returns, which we have from 1851 inclusive, give the following results:—1851, £1,615,878 19s. 6d.; 1852, £1,614,584 14s. 9d.; 1853, £2,355,255 2s. 2d.; 1854, £2,495,841 16s. 10d.; 1855, £1,986,980 16s. 10d.; 1856, £2,504,970 15s. 5d.

The productions of the Field are the true tests of a country's wealth and of its progress. By these we can form the safest estimates of its present as well as future capabilities; and I need not remind you of the vast, the direct, and the increasing importance of the relations between corn-consuming England and her corn-producing colony. The returns here give us evidence of the most satisfactory character.

	1851.	1852.	1853.
	£ s. d.	£ s. d.	£ s. d.
Vegetable Produce...	941,597 18 8	1,157,008 8 4	1,992,811 10 7
Animal Produce .....	.....	.....	342,631 7 0
Total .....	.....	.....	2,338,442 17 7
	1854.	1855.	1856.
	£ s. d.	£ s. d.	£ s. d.
Vegetable Produce...	1,882,680 2 8	3,257,599 18 2	3,743,068 17 8
Animal Produce	208,318 4 2	398,796 0 6	641,014 16 11
Total	2,090,998 6 10	3,656,395 18 8	4,384,083 14 7

Another source of wealth exists in Canada, which, up to the present time, has hardly received the attention it

deserves, and which offers a field for almost unlimited enterprise; I mean her fisheries. Along the shores and large rivers a continual harvest might be gathered in, and that too without lessening the productive powers of the field. Unlike the rock embedded minerals, limited in their quantity, and without the powers of increase, and which will bide their time without injury or decrease until the advancing industry of the country calls them from their earthy beds,—the denizens of the water form no item in a country's wealth and no part of its available resources, while they remain within the bosom of their natural world. Every one of these transferred from the water to the shore is as so much added to the wealth of the country.

The following returns show that some attention, however, is being directed to them:—1853, £85,000 18s. 8d.; 1854, £87,427 15s. 6d.; 1855, £114,980 1s. 0d.; 1856, £114,086 13s. 7d.

These tabulated figures represent the surplus wealth in productive industry only. We find, however, that manufacturing industry is sufficiently advanced to pay its tribute to the export trade of the colony. Under the head of manufactures and sundries we see its present condition:—1853, £64,507 5s. 3d.; 1854, £65,406 5s. 1d.; 1855, £136,169 19s. 9d.; 1856, £104,206 14s. 8d.

Under this head, also, we must include the returns of shipbuilding, which, though subject to great variations, is carried on to a considerable extent in the port of Quebec. These show a money value of—1853, £820,187 10s.; 1854, £552,062 10s.; 1855, £304,886 5s.; 1856, £303,269 7s. 6d.

If to these several amounts we add the estimated value of exportations to inland ports, which were as follows:—1853, £447,268 5s. 5d.; 1854, £442,470 3s. 3d.; 1855, £816,263 8s. 4d.; 1856, £559,725 0s. 0d., we arrive at the total value of the exportations of the Colony. —1851, £3,241,180 3s. 9d.; 1852, £3,826,901 15s. 6d.; 1853, £5,950,325 15s. 4d.; 1854, £5,754,797 10s. 9d.; 1855, £7,047,115 5s. 3d.; 1856, £8,011,754 4s. 6d.

When we turn to the home records of the colony, we find evidence of its condition and progress equally satisfactory. In 1851 the gross amount of wheat grown was 16,202,272 bushels, showing an increase of 400 per cent. during the 10 previous years, while, in the United States, the increase had only reached 48 per cent. In oats the produce increased 70 per cent., while that of the States was only 17 per cent. Even in Indian corn Canada compares favourably with the States, her increased production being equal to 163 per cent., while that of the States was only 56 per cent. But perhaps these points would be best understood by comparing them with those of a separate State of the Union, which should be a fair representative of its productive condition. Ohio has been selected for the comparison, and those who know that State will acknowledge that Canada has chosen no mean competitor. The land in Ohio is valued at nearly double that of the average of the Union, and has more than three times as many inhabitants to the square mile, she having 49-55, while the average of the Union is only 15-75. Let us look at some of the principal items. (See the table in the next page.)

These were the statistics of 1851, since then the country has been advancing at even a more rapid rate. In 1851 the gross wheat produce amounted to 16,155,356 bushels, in 1856 to 26,555,684, showing an increase of 10,399,738 bushels, which is equal to 64-3 per cent. in the five years, and raises the return from 8-9 bushel to 10-6 bushels per head of population. In barley and rye the returns are even more satisfactory, the surplus produce of 1855 being 566,534 bushels, while that of 1856 was 999,447, showing an increase of 74-5 per cent. in one year. In Indian corn an increased ratio of increase is seen, the exports of 1855 being 73,066 bushels, those of 1856 being 164,495, the increase amounted to 125 per cent., but even this is exceeded by that of oats, which present an increase of 250 per cent. in one year,

CANADA.

IN OHIO.

Population	1,842,265	1,980,427
Acres occupied, cultivated...	7,300,839	9,851,439
" " uncultivated	10,638,957	8,146,000
Total occupied	17,939,796	17,997,493
Acres occupied to each in-		
habitant	9 3 4	9 0 18
Acres of Wheat	1,136,311	1,231,437
Produce in bushels.....	16,155,946	14,487,351
Bushels per acre	14.2	12
Bushels per inhabitant	8.9	7.3
Increased value of occupied		
Lands	£65,879,048	£89,689,651
Wheat, produce in bushels	21,434,840	13,472,742
Barley	1,889,499	354,358
Oats	869,835	425,718
Corn	4,223,487	55,168
Wheat	591,438	544,499
Barley	385,377	463,397
Oats	1,597,849	3,942,929
Wheat	741,106	814,448

the quantity exported in 1855 being 370,275 bushels while, in 1856, it amounted to 1,296,677 bushels. The ratio of increase in the productions of the field appears to increase with that of the population; this latter, however, presents some remarkable features.

In 1763, the population of Canada is given at 82,000; 1814, 430,000; 1823, 575,000; 1831, 772,000; 1844, 1,099,000; 1848, 1,491,000; 1851, 1,842,265; 1856, 2,000,000. If we compare these returns with those of the States and also of this country, say for the last decennial census, we can form some idea of the relative population progress of Canada. In Great Britain the increase amounted to 13.2 per cent.; in the United States to 35 per cent., while the population of Canada increased 69 per cent., or if we were to take the western province alone, we should find an increase of no less than 104 per cent. in ten years. This increased population appears to be the very life blood of the colony. It fills and consolidates the body of the older settlements, and extends the boundaries of civilisation by reaching out and founding new ones. The returns of the census produce already quoted, increasing in their ratio with the increase of population, show that the most important element of progress is an increased population. This would naturally follow the course of time, or might be accelerated by immigration, and to this latter mode the government of Canada has very successfully addressed itself. This is a question, too, in which we have a direct interest, whether we view it in its commercial or imperial bearing. We have seen what the colony can supply to our necessities, let us now look at our imports, and see what in return she can consume of our manufactures. The value of the imports into Canada are, in

	£	s.	d.
1841.....	2,694,160	14	6
1850.....	4,245,517	3	6
1851.....	5,358,697	12	7
1852.....	5,071,623	3	11
1853.....	7,995,359	1	1
1854.....	10,182,331	6	9
1855.....	9,021,542	7	3
1856.....	10,896,096	16	2

Thus, while the export trade since 1851 shows an increase of, in round numbers, 150 per cent., the imports are fully doubled themselves in the same period.

* In the tables it must be understood that the money amounts are in the currency of the country, and that about one-half of both the exports and imports are transacted with the United States.

If we take the present productive returns of the cultivated lands as a basis for our calculations, it would be seen that the already occupied land in the colony would support a population of about 10,000,000 inhabitants, and if the present progressive rate of increase is sustained, a writer in "Hunt's Merchants' Magazine" tells us, that at the close of the present century we may expect to see Canada occupied by a population something like 20,000,000 in number. Whatever her numbers may be, it is quite certain that for years to come the great strength of the country will lie in the productions of her soil. With these she will pay for our manufactures; her surplus will supply our wants, and our surplus will administer to her necessities and comforts, and thus the scales of commercial benefit be kept pretty evenly balanced.

SOCIAL CONDITION, &c.

It is quite clear, I think, that there is ample space in Canada for a largely increased population, and it is equally clear, if we may judge from the past, that every increase is followed by a generally increased prosperity. To induce this by means of immigration, the government have lately offered free grants of land along three great arterial lines of road, which have been recently opened up and laid out for settlement. (These you will see marked on the map lying between the Ottawa and Lake Huron.) The grants are not to exceed 100 acres to each, and are offered on the following terms:—

1. That the settler be 18 years of age.
2. That he take possession of the land allotted to him within one month.
3. That he put into cultivation 12 acres of the land in the course of 4 years.
4. That he build a log house 20×18 feet, and reside on the spot until the conditions be fulfilled.

Families may reside on a single lot, and the several members having land allotted to them will be exempt from building and residence on each individual lot.

These lands are generally of very excellent quality, and well-adapted, in respect to soil and climate, to all the purposes of husbandry.

Australia excepted, no country can furnish such singular instances of the rise in the value of surveyed lands as the last five years have witnessed in Canada. The development of the railway system throughout the Province has been the principal agency by which this has been effected. When we recollect that 1852 saw Canada without a single railway, and that 1857 saw her with 1,500 miles completed, and 600 miles more in process of construction, the rise in the value of land is readily understood. The lines of railway must be looked upon as a series of accessible markets for the country they serve. The natural consequence is, that every product of the farm has acquired a certain money value, although before this new access to market it may have been absolutely valueless. The immense remuneration thus obtained for the same outlay of labour has greatly enhanced the value of capital. Land in old settlements, remote from lake ports, has doubled itself in value in five years; while wild lands in new settlements, near to which a railway passes, have trebled their value within a shorter period. These all-powerful means of communication have opened up the country, made available a vast amount of inert wealth, stimulated industry, and effected a complete revolution in farming economy within a range of twenty miles on either side of the course they take.

In all countries similar results have followed the introduction of railways, but in Canada, where lakes having formed the chief means of intercommunication, which were closed to all traffic during the winter months, the results are naturally more felt and more strongly marked. If we turn to the map we see the numerous lines already intersecting the centres of industry and population, while the Great Western Railway, running

Niagara to Detroit River—some 280 miles—and the Grand Trunk line stretching from Lake Huron in the north to Trois Pistoles on the east, connect all these with each other, and also with the seaports both of the St. Lawrence and the open Atlantic. This gigantic undertaking, rivalling in its magnificence the great river systems of North America, already has 849 miles in operation. Its length, when complete, will be 1,200 miles, and it will stand first among the railways of the world not only on account of its exceeding length, but especially for that triumph of engineering skill, which is to carry the line of rails across the broad and deep St. Lawrence, by a tubular bridge, of stupendous dimensions, and nearly two miles in length. This bridge (to be called the Victoria Bridge) will be finished and open for traffic in 1860; fourteen piers out of twenty-four are finished, and it is expected that the last one of the tubes will be in their places by the middle of the current year. The expenditure, so far, has amounted to £712,192, out of £1,250,000, the contract

never may be the results of these railways as mere investments, whether at first they are remunerative or not, this much is beyond question, that the nature of the benefits they confer on the country they serve cannot be too highly estimated. The railway policy of Canada has been successful in its soundness and completeness—it has had all the advantages of home experience and home capital; and it has been largely mixed up with its success—and its policy to ensure that, is to make known, to the world, the advantages it offers to those who are about to settle in the fertile lands of the Western Hemisphere. That may time will not allow me to give details of the admirable arrangements by which the emigrant is conveyed for one payment to the ports of this country, or, indeed, of the facilities of Canada, and farther still, the facilities of the United States—Kansas, Nebraska, &c. I can do more than give a glimpse of the great water highway, along which the goods from Lake Michigan, finds its way to the sea, and, in due time, hands over to the ships the goods that were shipped from the lakes. The natural difficulties of the country have submitted to the railway, both proper and subsidiary, and the most successful evidences of Can-

now with American travellers,* and when the communication with the Western States is fully opened up, we may easily imagine what the effect will be.

So far, I have not touched upon the cities of Canada, and I must still leave them unnoticed, save that one, "Ottawa," which has quite recently been constituted the Capital of this great country. In former times the seat of government has been turned in Quebec, Montreal, Kingston, and Toronto. For reasons, which I cannot enter on this evening, it was considered desirable to fix a permanent position for the government, and as each of the cities named in a claim for that honour and advantage, the Canadian people, through their representatives, wisely resolved to submit the question to the Queen, and accept the final decision. This decision was given without favour to any rival claims; a neutral city was chosen, offering great advantages, present as well as future, for the service of the Government, and situated so as largely to partake of all the facilities of communication with the various portions of the country in its charge.

The new capital stands at the mouth of the Rideau River, on the south-west side of the River Ottawa, and divides the upper province from the lower; the city is at about eighty-seven miles from the confluence of the Ottawa with the St. Lawrence. The distance here is about half a mile broad, the two banks being connected by a fine suspension bridge, erected by the Provincial Government. The population is at present about 10,000. The great facilities it offers to manufacturing and commercial industries, owing to its water, communications, and immense water power combined with the various charms of the newly acquired title of capital, will no doubt rapidly increase its numbers. The scenery round the city is of unsurpassed beauty—wild, romantic, picturesque, and presenting a variety rarely to be met with elsewhere. It is about the centre of the largest "lumbering" district in Canada, and minerals have been successfully worked in the district for some years past.

Between the shores of the Ottawa and Lake Huron lies a territory rich to profusion in mineral wealth, and vast forests which will afford for many years to come the source of profitable employment to the hardy labourer. As fast as the axe of the woodman levels the forest, the plough of the agricultural emigrant will turn up the soil, and rich harvests will be won for the supply of the extensive markets of the old and new worlds. But beyond this tract of timber and mineral lands, through which must shortly flow the waters of the Huron to mingle with those of the Ottawa, lie other lands yet unexplored and unsubdued to the wants of civilization.

Across the inland sea of the Huron there are the River settlements, the very garden of the Hudson's Bay territory, over which monopoly and exclusion have long thrown a veil of mystery,—but, from which, despite all restriction, there reach us rumours of rich and fertile lands, of abundant harvests, and of exhausted wealth in the waters, the forests, and the mines. To the westward lies a vast tract of territory, the solitude of which have been rarely disturbed, save by the trapper and the Indian hunters in pursuit of the wild animals for their furs. Century after century has passed over the regions watered by the noble Saskatchewan; the natural produce of the soil has decayed upon it year after year—the leaves of the dark forests have fallen in thousands of succeeding autumns, and have enriched the soil to an extent with which even the most highly cultivated lands of old countries can bear no comparison. Nature has given not only a fruitful soil but a genial climate

• Quebec to Liverpool.....	2,500 miles.
Portland to Liverpool.....	2,750 "
Boston to Liverpool.....	2,700 "
New York to Liverpool.....	2,900 "

land traffic developed by the demand for increased shipment either their area of power. Already we find the Grand Trunk Railroads of large tonnage plying on Lake Huron—while the undertakings, of considerable progress, under the dock and Wharfrage of Quebec making Quebec a great continent. To the great vessels can be sent to the harbour, with the purpose; and from the steamers of lighter draught collect cargoes for the interior, while the communication between the station and the two ad even

these regions, and magnificent crops of golden grain of all kinds must reward the industry of those pioneers of civilization, who, at no very distant day will awaken the lumbering echoes of this hitherto sealed land.

That this description is not overdrawn, Mr. Hinde's recent Report* to the Government bears testimony. He tells us that the area of cultivable land of the first quality in the valley of the Red River, and its affluent, the Assiniboine, within British territory exceeds 1,200,000 acres, and that the land adapted for grazing in the same valley exceeds 8,000,000 acres; that all crops cultivated in Canada succeed well, and often show a yield far in excess of Canadian returns; and that the climate, which is a few degrees more extreme than at Toronto, is well adapted for all the operations of husbandry. Sir W. Logan, too, tells us of the favourable geological features of the Ottawa and Lake Huron district, while in the reports of his able assistant, Mr. Murray, we find tracts of hard wood lands, sure indications of agricultural utility, being met with throughout the entire country. It is in this region that the government allot the free ranges of lands, which certainly offer great natural advantages to the hardy settler.

The report of another of Sir W. Logan's staff, Mr. Richardson, has called public attention to Anticosti, an island in the Gulf at the mouth of the St. Lawrence river. This large island, 135 miles long by 35 to 40 miles in its widest parts, and containing about 1,500,000 acres, is up to the present time totally unoccupied,—its only inhabitants, few in number, being engaged in attending the lighthouses and in hunting pursuits. This state of things will not long remain, as, thanks to the Geological Survey, we now know that the surface of the land is admirably suited to agricultural purposes. The easily disintegrating character of the rocks forming the subsoil can scarcely fail to have permitted a great mixture of their ruins with whatever drift may have been brought to constitute a soil, and it is reasonable to suppose that the mineral character of these argillaceous limestones must have given to those *débris* a fertile character. It is precisely on such rocks, in such a position, and with such an attitude, that the soils of the west peninsular of Western Canada, as also those of the Genessee country, in the State of New York, are placed. I have seen nothing in the actual fact," says Mr. Richardson, "to induce me to suppose that, in so far as soil is concerned, Anticosti will be any way inferior to those regions, and considerations of date only can induce the opinion that it would be in any way inferior to them in agricultural capabilities. In three months that I was on the island were altogether too short a time to enable me to form any opinion of the climate of Anticosti. But taking into view the fact that large bodies of water are more equable in temperature than large surfaces of land, I should be inclined to suppose that Anticosti would not be so cold in winter, nor hot in summer, as districts that are inland and more south, and that it would not compare unfavourably with any district between it and Quebec. While the autumn frosts would take effect at Anticosti, the spring would probably be a little later at Quebec. But such is the condition of the island, that not a yard of soil has been turned up by a permanent settler, and it is the case that about a million acres of good land, at the very entrance from the province, are left to lie waste, while great numbers are incurred to carry settlers to the most distant parts of the west."

Another important settling country of great prospects, between Quebec and the Gulf, has been discovered by Mr. W. Logan, the details of which will be given in my next report to the Provincial Government. In a

recent letter he says:—"Last summer one of my exploring parties visited the valley of Lake St. John, on the Saguenay. After passing the gneiss rocks, which give such grandeur to the scenery of the Lower Saguenay, and such a forbidding agricultural aspect to the land for a breadth of 50 miles, this party were very much surprised to find themselves in a valley, which, though 2 deg. north of Quebec, has a climate mild enough to ripen Indian corn and grow excellent wheat, and, in fact, to produce all that is produced between Montreal and Kingston. They went forward into this valley to the westward for 75 miles; it had then a breadth of 50 miles, and the boundaries of it on each side appeared to run on far enough to give 30 miles more in length, so that we may say 5,000 square miles of a good settling country were visible. The soil was generally argillaceous, and the entire valley appeared to be underlaid by lime-feldspar. Settlement is gradually extending into it, and the inhabitants are very prosperous."

Let me now briefly recapitulate the amount of accommodation which Canada offers to new settlers, and you will have a good idea of the enormous resources of the country. Her present population is about 2,500,000, while her lands already occupied are equal to the support of a population of 10 millions. Then we have Anticosti, with its million of fertile acres; the St. John's Lake Valley, where upwards of 3,000,000 acres have already been made known; and, lastly, the important districts lying between the Ottawa and Lake Huron, where government allotments are now being made. Beyond these, the vast territories of the N.W. stretch out their arms wide enough to receive the surplus population of the old world for well-nigh all time to come.

A circular, addressed by the Minister of Agriculture, at the commencement of the present year, to the various municipalities of the province, brought replies from 154 places offering immediate remunerative employment to 15,115 emigrants, either on the farms or in different branches of industry. Great as the advantages offered are to the mere labourer, and important though he be as an element of progress to the Colony, I cannot help thinking that, were the subject liberally entertained by the provincial government, and judiciously handled at home, a higher class emigration might be induced, which, while it would, from its own superior powers, be able to advance itself far more rapidly, and with more certainty, than the lower class, would, from these very circumstances, return a greater and more permanent, as well as a more speedy benefit to the province. This would be drawn from the ranks of the small capitalist—especially the small farmer—the man struggling, more or less hopelessly, against the onward progress of agriculture, without a sufficient knowledge of the principles of his craft, or the capital necessary for its successful prosecution. These deficiencies, fatal obstacles to his future at home in an old country, would disappear in Canada, where the contents of his head and of his purse would at once assume a higher value, and would be invested with the certainty of immediate and increasing returns. He would there find a soil capable of producing every variety of agricultural produce—a climate well suited to English constitutions—a country traversed from one extremity to the other by rivers, roads, railroads, and telegraphs—exhibiting signs of prosperity and comfort everywhere, and in many places even the superfluities and luxuries of older countries. Its admirable School System, unequalled even by that of any State of the Union, would relieve the mind of the settler from one serious consideration, by assuring him of educational advantages far beyond what he has been accustomed to at home. And should he fancy that a Canadian home would leave him ignorant of what was going on in the various parts of the mighty world he had left, his doubts would soon be dispelled by showing him that the public press of Canada already numbers 247 newspapers and periodicals among its productions. Intelligence lags not there on its road, for these, with the ar

off for the purpose of allowing the ice to pass away at its breaking up in the spring, which in that country was a formidable occurrence indeed. Within the last four or five weeks, the ice was piled up to a height nearly equal to that of the under surface of the tubular girders, but notwithstanding its unusual accumulation this season, every pier stood as solid as the rock on which it was founded. This was important to notice, inasmuch as some of the fine masonry with which the quays along the river at Montreal were built was greatly damaged and torn up by the violence of the ice. He might mention a circumstance of some importance which had occurred that day, although he could not state it as a certain fact. It had been proposed that the *Leviathan* should run for a period of years in connection with the Grand Trunk Railway of Canada, and this would be the means of carrying out emigrants to that colony and the Western States of America with an amount of comfort and attention to the wants of those persons, such as had never been experienced up to the present time. He believed the whole combination would be one that would be eminently successful. It was a curious coincidence that exactly 10,000 tons of iron were used in the construction of the *Leviathan*, and the same amount of iron would be required for the tubes of the Victoria Bridge. Allusion had been made to the progress of the electric telegraph system in Canada. He only wished that the progress made there would react a little in this country. In Canada a message of ten words, exclusive of the addresses of the sender and receiver, could be sent between Quebec and Montreal, a distance of 180 miles, for 6d., and a halfpenny for every additional word; whilst for the shortest message to Liverpool—200 miles—the charge was 4s. From Quebec to Hamilton, between 400 and 500 miles, the charge for ten words was only 1s. 6d.

Mr. G. F. WILSON, F.R.S., would say one word with reference to the latter portion of the paper, and the commentary of Sir Cusack Honey upon it. He (Mr. Wilson), in common with most other employers of labour, was often consulted by men who had saved a little money in this country, and who wished to benefit themselves and their families by emigration, but who did not see their way to do so. They were dissatisfied with their prospects at home, and they came to him for advice as to where they ought to go to. Up to the present time he had said that he believed Canada to be the right place. But this paper, he thought, gave the whole of the information that was required, and when it was remembered that it would be laid within a few days upon the tables of upwards of three hundred Mechanics' Institutions, and would be read by thousands of working men throughout the country, it was impossible to exaggerate its importance.

The CHAIRMAN said, considering that Canada was one of the finest dependencies of the crown, he thought they could not but feel indebted to Professor Wilson for placing before the public an account of the resources of that country. He was, therefore, sure that they would heartily unite with him in according their thanks to Professor Wilson for his very admirable paper.

The vote of thanks having been passed,

Professor WILSON begged to express his acknowledgments for the honour they had done him. With respect to the fisheries, those he had alluded to were not at the upper part of the St. Lawrence so much as at the lower part, and on the Gulf. He was sure that anyone who was fond of salmon-fishing, and who had read the accounts which he had seen in reference to it, would not think of going to Norway, but would start at once for the St. Lawrence. In the Saguenay and the lower St. Lawrence, he believed the salmon fishing was of the very finest description. A paper on this subject had been written by his friend Dr. Adamson, of Quebec, which afforded valuable information to those who went out upon such an expedition; and there was also a communication from Mr. Nettle, confirming all that Dr. Adamson and

others had written. But there were other fisheries of greater importance than the salmon. In the St. Lawrence—in the lower part of the river—the porpoise fishery was carried on, for the purpose of furnishing oil for the lighthouses, but he believed the extent to which it had been carried on was barely sufficient for the supply required by the contract which had been entered into. In the Exhibition of 1851, a novel feature in the Canadian products was a species of leather prepared from the skin of the porpoise, for which the exhibitor, as an encouragement to pursue the matter, was rewarded with a medal, but he believed very little had been done with reference to it since.

Mr. SIMMONDS stated that it was to some extent an article of commerce in this country, and was used for shoe leather and for other purposes.

Professor WILSON added that he thought it was an article well worth attention. With regard to the salmon fisheries in that district, he was sure they would be carried out to a very large extent. He had tasted salmon in Scotland that had been sent from Vancouver's Island, and it was as fine flavoured as any he had ever eaten. With regard to the exports and imports of Canada, although the imports appeared to exceed the exports by about £2,000,000, yet this must not be considered as unfavourable symptom. He found, comparing the exports of 1856 with those of 1851, there was an increase of 30 per cent., whereas the imports had increased only 100 per cent., and at that rate the exports would soon equal the imports in amount.

A Map of Canada, showing the principal geological features of the country, will be issued with next week's number of the *Journal*.

The Secretary announced that an Extra Meeting would be held on Friday next, the 14th inst., when a paper by Mr. T. Baker, "On the Plan Suggested by the Government Commissioners for Disposing of the Metropolitan Sewage," would be read, and that on Wednesday next, the 19th inst., a paper by Mr. Hyde Clarke, "On the English Settlement of the Hill Regions of India," would be read.

MECHANICS' INSTITUTIONS AND MR. BAINES

At a meeting of the Council of the Institutional Association of Lancashire and Cheshire, held in Manchester on Saturday, 24th April, 1868, it was resolved, on the motion of Mr. Councillor Rumney, and seconded by Isaac Gregory, Esq., F.R.G.S.:

"That the thanks of the Council of the Institutional Association be presented to Edward Baines, Esq., for his admirable letter addressed to the Editor of the *Times* entitled 'Are Mechanics' Institutes a failure or success.'"

"That this Council has no hesitation in assuring Mr. Baines that Mechanics' Institutions in Lancashire and Cheshire have fulfilled the chief objects of their foundation by imparting practical and useful instruction; and that their representatives, the members of this Council unanimously express their deep obligation for his able and generous advocacy of their cause."

J. W. HUDSON, Ph.D., Chairman.
DAVID MORRIS, Hon. Secretary.

SOUTH KENSINGTON MUSEUM.

During the week ending 8th May, 1868, the visits have been as follows:—On Monday, Tuesday, and Saturday (free days), 6,872; on Monday and Tuesday

(free evenings), 4,825. On the three Students' days (admission to the public 6d.), 386; one Students' evening, Wednesday, 189. Total, 12,272.

Home Correspondence.

MR. SANDERSON'S PAPER ON IRON.

SIR,—In the report of the discussion on the paper read last Wednesday, by Mr. Sanderson, "On the Manufacture of Iron," I am made to say that about seven tons of atmospheric air are blown into the furnace to make a bar of iron, instead of a ton. As the error is almost obvious, I should not have written to request its correction, but Mr. Newton's observations on the remarks I made, which the lateness of the hour caused me to pass without reply at the time, induce me to address you now. I am well acquainted with all the attempts which have been made to economise the waste heat of the gases from the blast furnaces, most of which had been failures, until I had the pleasure, about eleven years ago, to see a plan which effected this object with complete success, carried out at the Iron Works of Ystalyfera, in South Wales.

The method of doing this was contrived by Mr. Budd, the manager. The quantity of solid materials thrown into the furnaces to make one ton of cast-iron was about $\frac{1}{2}$ tons. These works produced 40 tons per day of very strong metal, and consumed

Mineral, a clay ironstone	100 tons.
Fuel—Anthracite	80 "
Flux—Mountain limestone	30 "

Total 210 tons.

To smelt these solid materials in 24 hours, 20,736,000 cubic feet of air were blown into the furnaces, which, at a mean density of 1.23 ounces to the cubic foot, amounts to 705 tons per day. It was not attempted to ignite the heated vapours from the furnaces by a mixture of atmospheric air, which is sometimes attended with danger, but they were brought down hot from the blast furnaces, and the heat which they brought with them was directly applied to useful purposes. The steam which worked the blast-engine was raised by carrying the heated vapours under and round the boilers, and the saving of coal effected by the economical use of the gases amounted to £3,000 a year.

I subsequently advised the adoption of a similar plan at the Butterley and Codnor Park Iron Works, Derbyshire, where the Butterley Company continue to use it at both the above named works with complete success. But generally speaking those gases are wasted, and those who travel by night through the iron districts of Staffordshire and elsewhere, see the country illuminated by their flames. This is a waste of coal and of money, and as coal is one great cause of England's prosperity, it ought to be better cared for, and its waste avoided.

I am, &c.,
JOSEPH GLYNN.

23, Westbourne-park Villas, London, W.,
May 8th, 1858.

MEETINGS FOR THE ENSUING WEEK.

- Mon. Architects, 8.
United Service Inst., 8 $\frac{1}{2}$. Capt. Blakely, "On a Method of Making Cannon."
Tues. Royal Inst., 3. Mr. J. P. Loeblitz, "On the History of Italy during the Middle Ages."
Civil Engineers, 8.
Fustichol., 8. Mr. Hendricks, "On Indian Revenues."
Wed. Pharmaceutical, 11 a.m. Anniversary.
Society of Arts, 8. Mr. Hyde Clarke, "On the English Settlement of the Hill Regions of India."
Microscopical, 8.
Royal Soc. Ed., 8 $\frac{1}{2}$.

- Thurs. Philosophical Club, 8 $\frac{1}{2}$.
Antiquaries, 8.
Chemical, 8.
Philological, 8. Anniversary.
Royal, 8 $\frac{1}{2}$.
Fri. United Service Inst., 3. Lieut.-Col. F. Eardley-Wilmot, "On the Manufacture of Ordnance in the Royal Arsenal, Woolwich."
Royal Inst., 8 $\frac{1}{2}$. Prof. T. H. Huxley, "On the Phenomena of Gemination."
Sat. Royal Inst., 3. Dr. Lankester, "On the Vegetable Kingdom in its relations to the life of man."
Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Part. No. *Delivered on 28th April, 1858.*
57 (2). Savings Banks—Account.
173. Royal Navy—Paper.
212. Army—Return.
219. British Museum—Account and Estimate.
224. Smithfield Market Site—Return.
228. Sutherland Dock Bill—Return.
55. Bills—County Management.
59. ——— Local Management.
62. ——— Chancery Amendment (amended).
63. ——— Church of England Special Services.
64. ——— Stamp Duty on Drafts.
65. ——— Exchequer Bonds (£2,000,000).
Dioceses of Canterbury, London, Winchester, and Rochester—Report of the Commissioners.
Delivered on 28th April, 1858.
180. East India (Retired Officers, &c.)—Return.
196. Woolwich Royal Military Academy—Return.
205. Grand Jury Presentments (Ireland)—Abstract of Accounts.
229. East India (Mutinies)—Copy of a Letter to the Governor-General of India.
Medical Charities (Ireland)—6th Annual Report of the Commissioners.
Delivered on 30th April, 1858.
186. Newspapers—Return.
204. Reformatory Schools—Return (a corrected Copy).
217. Soulagas Collection—Return.
232. Model Barracks and Public Offices—Return.
233. Enfield Factory—Return.
239. East India (Railways)—Return.
68. Bill—Masters and Workmen.
Delivered on 1st and 3rd May, 1858.
221. East India (Mutinies)—Copies of Reports and Dispatches.
237. Battersea Park, &c.—Return.
240. Small Arms—Return.
341. East India (Army)—Return of the Sea Kit.
243. Pridcaux's Furnace Valve Door—Return.
201 (8). East India (Revenues, &c.)—Returns.
244. Roads, &c. (Scotland)—Return.
118. Local Acts (32. Durham and Cleveland Union Railway; 33. Ballymena, Ballymoney, Coleraine, and Portrush Junction Railway)—Admiralty Reports.
66. Bills—County Franchise.
70. ——— Poor Law Amendment (amended).
67. ——— Weights and Measures.
71. ——— Oaths (Lords Amendments).
Delivered on 4th May, 1858.
201 (9). East India (Revenues, &c.)—Return of the Number of Officers on the Retired List, &c.
201 (10). East India (Revenues, &c.)—Statement of Summs Subscribed to each of the Public Loans, &c.
225. Mercantile Marine Fund—Account.
226. Merchant Seamen's Fund—Account.
231. Exhibition of 1851—Accounts.
234. Examinations (Army)—Return of Names of Successful Candidates.
248. Enrolled Pensioners, &c.—Return.
249. East India (Boydell's Traction Engine)—Return.
68. Bill—Universities (Scotland).
Delivered on 5th May, 1858.
162. Civil Service Estimates—Classes 1-8.
251. East India (Civil Service)—Regulations for Examination of Candidates.
118. Local Acts (34. Stockton and Darlington Railway (North Riding Lines)—Admiralty Report.
64. Bills—Patent Law Amendment.
59. ——— Medical Profession and Medical Corporations.
Delivered on 6th May, 1858.
208. Poor Rates, &c. (Metropolitan Districts)—Return.
238. Metropolitan Turnpike Roads—32nd Report of the Commissioners.
247. County Treasurers (Ireland)—Account.
Delivered on 7th May, 1858.
98 (A II.) Poor Rates and Pauperism—Return (A).
168. Increase and Diminution (Public Offices)—Abstract of Accounts.
169. Superannuations (Public Offices)—Accounts.
265. South Kensington Museum, &c.—Returns.
267. Navy (Continuance Service Men)—Return.
74. Bills—Non-Parochial Registers.

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Journal of the Society of Arts.

FRIDAY, MAY 21, 1858.

NOTICE TO MEMBERS.

the Society's financial year closes on the 1st. Members whose subscriptions have not been paid, are particularly requested to send the amount to the Financial Officer at the earliest convenience.

Bailey Denton has forwarded to the Secretary an invitation to any Members of the Society interested in Agricultural Drainage, to send him with their company at Hinxworth, on Friday, the 27th inst. Mr. Denton says:—

"The months have elapsed since a large party of artists interested in drainage visited Hinxworth. The object of improvement, comprehending the drainage of about 800 acres of land, and the making of above ground farm roads, were then on the eve of completion. The drainage was specially interesting, owing to the character of the works,—which comprehended the drainage of the gault clay by close parallel drains, at £6 10s. per acre,—and the drainage of mixed soils, wet, by occasional drainage costing only £1 per acre. Careful records have been kept of the results, the daily quantities discharged from the drains, the reciprocating presence of water in test-tubes, barometric changes and influences, and the nature of the soil at different depths. These have been printed and published, and they prove conclusively the permeability of drained clay soils. The present aim is, in soliciting the favour of inspection, is to enable all persons interested in drainage to trace the effects now that the drained lands are cultivated and cropped,—and every means is afforded visitors of judging of the pecuniary benefit attending the improvements. The company are requested to meet at the farm-house, covered yard, at 11 o'clock. The Hinxworth is readily approached from Biggleswade, and Baldock."

LOCAL BOARDS—PREVIOUS EXAMINATION.

seventeen Local Boards of Examiners have been named. Returns of the Candidates who attended the Previous Examination have been received as follows:—

Leeds	4
Wakefield	6
Pembroke Dock	3
Leeds (Christian Institute), No. 1.	14
Wharfedale	1
Thames	2
Ammanford	1
Leeds	2
Leeds	83
Leeds-on-Tyne	3
Leeds	1
Leeds	4

Leeds, No. 2.	10
Wakefield	4
Pembroke Dock	4
Ipwich	6
London Mechanics' Institution	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	18
Halifax, No. 1.	15
Salisbury	1
Liverpool	35
Lockwood	1
Halifax (Working Men's College), No. 2.	21
York	7
Berkhamstead	19
Bristol	11
London Domestic Mission	1
Royal Polytechnic Institution	28
Birmingham, No. 1, (Messrs. Chance's Reading Room)	2
Sheerness	1
Sheffield (People's College), No. 1.	15
Sheffield (Mechanics' Institution), No. 2	3
Blackburn	5
Crosby Hall (London) Evening Classes.	25
Windsor and Eton	10
Greenwich	1
Institutional Association of Lancashire and Cheshire	100
Lewes	2
Brighton	3

The number of Candidates who propose attending the Final Examinations is 337.

The total number of Candidates who have been examined by the Local Boards, is 1,108.

EXAMINATIONS.—PRIZES FOR 1858.

The following Prizes are offered to the Candidates, viz.:—

One First Prize of £5, and one Second Prize of £3 in each of the 26 subdivisions of the subjects of Examination.

No Prize in any subject will be awarded to a Candidate who does not obtain a Certificate of the first class therein.

The Prizes will be given in money or in books, at the option of the Candidate.

The following Prizes are offered to the Local Boards, viz.:—

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than ten) bear the largest proportion to its whole number of Candidates.—One Prize of £10.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than eight) bear the largest proportion to its whole number of Candidates.—One Prize of £8.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than six) bear the largest proportion to its whole number of Candidates.—One Prize of £6.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than four) bear the largest proportion to its whole number of Candidates.—One Prize of £4.

No Local Board can receive more than one of these Prizes.

These sums may be applied by the Local Boards to the payment of the expenses of the

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the *Leviathan*, and the electric telegraph—there can be any real practical engineering difficulty in this latter half of the nineteenth century, in thoroughly draining even the metropolis of the world, or in carrying the refuse to any distance where it may be safely disposed of. Yet we are still hammering at the plan!

EXISTING SEWERAGE AND PROPOSED PLANS.

The existing main sewers, north of the Thames, are four in number, independently of Hackney Brook, which falls into the river Lea:—1. The Ranelagh Sewer, running from Hampstead, through Kensington, to Chelsea, where it discharges its contents into the river, near the Naval Hospital. 2. The King's Scholar's Pond Sewer, also from Hampstead, a little more to the east, following the line of St. John's-wood, and the Grosvenor district, falling into the Thames at Pimlico, near Vauxhall-bridge. 3. The Fleet, from the west of Highgate, through St. Pancras, King's-cross, and Clerkenwell, to Blackfriars. 4. Walbrook Sewer, from Hornsey to the City, by the Bank and London bridge. These main sewers receive the surface and house drainage from all the districts to the east and west of them respectively. On the south side are the Effra Sewer, and some others. To relieve the Thames from these foul discharges is the problem to be solved.

A description of all the plans which have from time to time appeared for this purpose, would occupy several volumes, upwards of 150 having been submitted on one occasion. This, therefore, will not be attempted; but I propose shortly to glance at the principal schemes that have been laid down. These are—

1. Simply to intercept the sewage from falling into the Thames, near London, conveying it into, or near the sea.
2. To utilize and make profitable the sewage, which has been intercepted, by the irrigation of meadow lands with the water, holding the deodorized refuse in suspension.
3. To purify the river itself, independently of the sewage.
4. Lastly, the plan which has just appeared, under the auspices of the Royal Commission, for combining the two latter objects with the general adornment of the Thames; and the relief of the streets from superabundant traffic.

INTERCEPTING MAIN SCHEME.

The great intercepting main plan, now so long before the public, with which the name of Mr. Frank Fowler has usually been connected, as the proposer, was based upon the labours of Mr. Roe, and other engineers, previously in the service of the Commissioners of Sewers. This plan has been further modified by Messrs. Hayward and Bazalgette.

The matured scheme of the latter gentleman, proposed to construct three large mains at different levels, running parallel with each other, in the lines of Camden Town, the New-road, and Fleet-street, respectively, and terminating in a large reservoir at West Ham,—the sewage of the south side having its termination at Greenwich,—before reaching the final outfall at Barking Creek, from the lowest of which mains, the sewage would require to be raised by pumping. Besides the three intercepting mains on the north, and one on the south side, on the Brixton line, special provision was to be made for the western and lower southern districts; the sewage being deodorized, so as to allow the water, after the organic matter had been precipitated, to flow into the river, and the solid residuum sold for manure. For this purpose large reservoirs were to be provided, into which the sewage would require to be pumped by steam engines, preparatory to the work of deodorization.

It is important to observe, that the principle of pumping and of deodorization, allowing the purified water to flow into the river, was here fully conceded; but this was not the first time that a system of pumping had been pro-

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posed, for as early as 1848-9, Mr. Austin had recommended the formation of district stations, from which the whole of the sewage might be pumped into the suburbs for agricultural purposes.

There have not been wanting practical men of opinion, that this scheme of Mr. Austin's was feasible, and that it would have proved not only cheap in comparison with the intercepting tunnel plans, but even more effectual: and it has been thought, by some persons, that the use of a new and ugly word mainly contributed to the popular disfavour with which this plan was received. Mr. Austin had designated his proposed receptacles "sumps,"—a mining term, suggested by a celebrated geologist, who was one of the Commissioners of Sewers at that time. What was meant by "sumps?" We had never been accustomed to the sound of "sumps." A "sump," especially when connected with sewage, could only be something horrid and disgusting. Why were such nuisances to be forced upon the people? The very idea became odious! The proposition was deemed a positive injury, and the scheme was consequently hooted down, to be partially revived, as we have seen, some five years later;—with this difference, that the reservoirs were to be above, instead of underground.

There has been, from time to time, considerable discussion as to the sizes of the sewers best calculated to secure the proper drainage of houses, and, at the same time, provide for occasional storm-waters being carried off without inconvenience. This question has caused much delay, but need not be entered upon at present.

Soon after the passing of the Metropolis Local Management Act, in 1855, the general plan of interception was revived by Mr. Bazalgette, and adopted by the Metropolitan Board of Works; but, after revision by Captain Bursall, (who advised the river at Erith as the outfall, in lieu of Barking Creek), was finally rejected by H.M. First Commissioner of Public Works, who referred the plan to Capt. Galton and Messrs. Simpson and Blackwell, with special reference to the proposed outfall at Erith.

These gentlemen have reported against the outfall adopted by the Board, and recommended the construction of channels on both sides of the river, together about 47 miles in length, chiefly open, but partly covered, for the purpose of carrying the sewage to Sea Reach, near the mouth of the Thames.

The estimated cost of the intercepting sewers recommended by this plan is upwards of two millions and a quarter, and of the continuing channels to Sea Reach, upwards of three millions and a half; together about six millions,—from which no return whatever is to be looked for.

This plan of the Referees, on being submitted to the Metropolitan Board of Works, was itself referred by that body to two other engineers, who have just reported that in their opinion the proposed works would cost full eleven millions;—and suggested other modifications in the scheme of Mr. Bazalgette.

UTILISATION OF THE SEWAGE.

Among the proposals for turning the sewage of London to a profitable use, in addition to those already mentioned, a scheme, propounded several years ago by Mr. McLean, of taking such of the contents of the sewers as might be purchased for manure from West Ham into the river Crouch, near to the sea, was, about two years since, reported by Sir Morton Peto, who offered to find the necessary capital, and to execute the works, on condition at 4 per cent. per annum on £600,000 were guaranteed him by Government, he being at liberty to dispose of the sewage at any points of its course for distribution over the lands;—and it was calculated that in a short time, though, perhaps, not at first, very little, if any, of this sewage would be allowed to reach the Crouch. Meantime, so much difficulty had been felt, not only in London, but in different towns throughout the country, at the increased pollution of rivers where systematic

drainage works had been carried out, that soon after this proposition of Sir Morton Peto's had been made, the Government appointed a Royal Commission to examine whether the assertions of the economists were well founded, viz.,—that town sewage is valuable as manure, and that, therefore, to spend an enormous sum to throw it away would be committing a double waste.

The Engineering Referees appointed by the First Commissioner of Works, were instructed to put themselves in communication with the Sewage Commissioners, but the former having advanced their inquiries on the plan, while the latter body had scarcely commenced its labours, the Engineers thought fit to offer their own opinion against any attempt to turn the metropolitan sewage to account, whilst the Commissioners, who have now presented a preliminary report, not only decide that town sewage is valuable; is capable of being deodorized without nuisance or injury to health; and ought, therefore, to be used instead of being thrown away; but offer a new plan for dealing with the sewage of London.

In this preliminary report we are not furnished with an estimate of the probable sum which would be realized from the sale of the metropolitan sewage as manure,—details from being promised in a future report,—but the general conclusions now given, with respect to the whole subject of the disposal of the sewage of towns, are as follows:—

"1st. That the increasing pollution of the rivers and streams of the country is an evil of national importance, which urgently demands the application of remedial measures; that the discharge of sewage and of the noxious refuse of factories into them is a source of nuisance and danger to health; that it acts injuriously not only on the locality where it occurs, but also on the population of the districts through which the polluted rivers flow; that it poisons the water, which in many cases forms the sole supply of the population for all purposes, including drinking; that it destroys the fish; and generally that it impairs the value and the natural advantages derived from rivers and streams of water.

"2nd. That this evil has largely increased with the growing cleanliness and internal improvements of towns as regards water supply and drainage; that its increase will continue to be in direct proportion to such improvements; and that as these improvements are yet very partial, the nuisance of sewage, already very sensibly felt, is extremely slight as compared to what it will become when sewage and drainage works have been carried into full effect.

"3rd. That in many towns measures for improved water supply and drainage are retarded, from the difficulties of disposing of the increased sewage which results from them; that the law which regulates the rights of outfall is in an anomalous and undefined condition; that judicial decisions of a conflicting character have been arrived at in different instances; and that consequently the authorities of towns have constantly before them the fear of harassing litigation.

"4th. That the methods which have been adopted with the view of dealing with sewage are of two kinds; the one being the application of the whole sewage to land; and the other, that of treating it by chemical processes, to separate its most offensive portions; that the direct application of sewage to land favourably situated, if judiciously carried out, and confined to a suitable area exclusively grass, is profitable to the person so employing it; that where the conditions are unfavourable, a small payment on the part of the local authorities will restore the balance.

"5th. That this method of sewage application, conducted with moderate care, is not productive of nuisance or injury to health.

"6th. That when circumstances prevent the disposal of sewage by direct application to land, the processes of precipitation will greatly ameliorate, and practically obviate the evils of sewage outfalls, especially where there are large rivers for the discharge of the liquid; that

methods of treating sewage do not retain more than a comparatively small portion of the fertilizing matter, and that although in some cases the sale of the manure may repay the cost of production, they are not likely to be successful as private speculations.

"7th. That considered merely as the means of mitigating a nuisance, these precipitating processes are satisfactory; that the cost of them in any case is such as town populations may reasonably be called upon to meet; that the necessary works need not, if properly conducted, be a source of nuisance; and that, by modifications of the existing methods, even the slightest risk of nuisance may be entirely obviated.

"8th. That the employment of the one or other method of disposing of sewage, or of both conjoined, must depend upon locality, levels, markets, and a variety of other circumstances, and that the case of each town must be considered upon its own peculiarities.

"9th. That there is good ground for believing that the methods yet proposed for dealing with sewage are not the best that can be devised, and that further investigation will probably result in the discovery of processes more thoroughly equal to the suppression of the nuisance, and at the same time calculated to give more valuable products.

"10th. That the magnitude of a town presents no real difficulty to the effectual treatment of its sewage, provided it be considered as a collection of smaller towns."

I believe that it has been proved in several of our cavalry barracks, and by dairymen, that the best disinfectant for stables, cowsheds, and piggeries, at the same time greatly improving the health of the cattle where used, is a powder manufactured by Mr. McDougal, of Manchester, a paper on which was recently discussed by this Society. If this powder has not yet been brought under the notice of the Commissioners, it may be worth a trial, if not for the precipitation of the sewage, at least for the defecation of the solid portions of the manure, of which it much increases the value by fixing the ammonia.

PURIFICATION OF THE THAMES.

With regard to the purification of the River Thames, independently of the continued discharge of sewage into the stream, a valuable report, by Mr. Goldsworthy Gurney, was printed, by order of the House of Commons, in December last. In this report it was shown that the solid matters of sewage, being considerably heavier than water, sink at the rate of about a foot per minute in still water or slow currents—and that they will also precipitate in stronger currents, even up to the rate of 170 feet per minute; but, when the current runs above this rate, the sewage is kept in a state of mechanical admixture with the water. Consequently, sewage will deposit at all times of the tide along the banks, where the current is always sufficiently slack; although, in the middle of the stream, while the tide is running full, such portions as have not already sunk will continue suspended in a mixed state. When the tide is not running it sinks in all parts. It follows that immense deposits of sewage and foul matter are retained in the mud banks along shore—the accumulations of centuries, and that these deposits can never be removed by the tidal influence. Eddies along shore, produced by the opposition of the freshet, down the river to the flow of the tide, and running upwards at the ebb, would prevent this, even were the foul matter in a state of admixture with the water.

"The tide," says Mr. Gurney, "off the terrace at the Houses of Parliament, runs at an average rate of from three to four miles per hour in the middle of the stream; towards the sides its rate is considerably less; within eight yards of the shore it never runs at a rate exceeding 78 feet per minute; nearer to the shore it generally falls into a slack—at from two to four yards off the shore, the tide is either still or takes an opposite direction; when the stream runs up, the eddies run down; when the

stream runs down, the eddies run up; as is the case in all tidal rivers. Between these currents the natural water brattice is formed, with a series of recesses, or little cesspools running along shore." Mr. Gurney explains that the water brattice is the still line which divides two retrograde or opposite parallel currents. "Within these brattices a large quantity of sewage is always precipitated and permanently retained. On looking along the river, two black lines may generally be seen stretching along the sides; these black lines are the series of cesspools just adverted to, filled with sewage."

As a natural consequence, it was found, by careful experiment, that the water at the sides was at all times more than five times as foul as that taken from the middle of the stream.

Again, Mr. Gurney says, "in the river, at high water, about the turn of tide, there is a notable period in which the water is still, or nearly so, for about 10 or 20 minutes. The sewage will then fall about the rate of a foot per minute, and if it continues for 10 or 20 minutes, the sewage will fall as many feet; at this depth it will reach the bottom in many places. After the tide has turned, and the slow current commenced, the sewage will still continue to sink in the slack, retrogrades, and eddies along shore, where it will remain until the turn of tide. A large portion on the flow will be stirred up and carried back again by the upcast."

He proceeds to point out that the quantity of foul deposit retained in the Thames is nearly constant, being governed by the size of the slack and retrograde currents; that the sewage, if discharged into the river at all, no matter how far down, would be brought back by the upcast; and that if the retrograde currents be not destroyed, it will be retained in the stream in large quantities. But if the retrogrades are destroyed, the sewage will not be so retained, as in all tidal rivers where there is no room at the sides for slacks or retrogrades to form there is no deposit; and he recommends—

"That all the retrogrades and brattice cesspools be destroyed.

"That all obstructions to a uniform flow of the river, at low water, be removed.

"That the projections along shore be rounded off, and the hollows filled up.

"That the serrated edges of the river at low water be made plain, and continued along the whole line of low water mark.

"That the width of the whole water-way, when the tide is at its lowest ebb, be not more than 140 yards from side to side; so that the river may run, not only in a uniform current, but at a rate of not less than 25 feet per minute."

He adds, that by these means, "the navigation of the river would be improved."

Mr. Gurney observes, in conclusion, "that the above recommendations do not interfere with any vested interests, or affect the navigation of the river, [while the works are in progress], and, therefore, may be carried out at once."

PLAN OF THE ROYAL COMMISSIONERS.

We arrive at length at the plan just promulgated by the Royal Commissioners, the novelty of which consists in turning to account facilities afforded by one necessary work for executing a second, and not less important undertaking;—thus concentrating into one grand scheme various propositions which, separately, could not have been carried into operation without very much greater difficulty and expense; whilst it may also lay claim to that candour which is willing to adopt whatever is good may be found in the plans which have from time to time been launched, in attempting the solution of that most desirable consummation, the effectual drainage of London, in combination with the effectual purification of the Thames.

The Commissioners, whose preliminary report is dated 26th March, 1858, propose to collect the sewage in intercepting reservoirs, constructed at the present outfalls along the river banks, and these reservoirs, being chambers formed in the embankment walls about to be described, everything in connection with them will be quite out of sight. Each receptacle will continue to form, as it were, the outfall of a separate town, at which the work of deodorization, pumping, &c., will be carried on independently of the others.

The present sewers, which, small and large, extend to above a thousand miles in length, will remain undisturbed; only that a few intersecting mains for the higher, and collecting mains for the lower, levels, will be required for conducting the sewage into the reservoirs. The purified water, all organic matter having been first precipitated by the most improved chemical means, will be allowed to flow into the river—as proposed by various persons, and amongst others by Messrs. Haywood and Bazalgette, in 1852, for the western district—and the thick alimy residuum, pumped either into the rural suburbs for manure, or to the sea, whither it may even be removed daily in barges, should the demands of the gardeners and farmers be unequal to the supply. In this manner the questions of drainage, and application of the sewage to agricultural uses, are disposed of: and the Commissioners show that there can be no foundation for any apprehension of nuisance arising from the sewage, or the works.

In corroboration of this opinion there is appended to the report of the Engineers recently consulted by the Metropolitan Board of Works, and published almost simultaneously with the report of the Royal Commissioners, a letter from Dr. Letheby, the City Medical Officer of Health, to which my attention has been called since this paper was first written. Dr. Letheby says:—"By the action of lime on sewage, the sulphuretted hydrogen and carbonic acid are fixed, as well as a small portion of the soluble organic matter, forming a precipitate, which contains carbonate of lime and the insoluble matters of the sewage. This precipitate is in a flocculent form, and it rapidly subsides, leaving a clear liquor, which is nearly deprived of odour.

"I am quite sure that the process of defecating the sewage of London, by means of lime, may be effected with advantage and perfect safety, and that the discharge of the clear sewage water into the Thames will not be a source of danger or discomfort to the public."

On the plan of the Royal Commissioners, the means for constructing the large reservoirs are to be provided by the adoption of a modification of Mr. Page's scheme for embanking the Thames, recommended by the Metropolitan Improvement Commissioners in their report of 1844. This will also secure the object of Mr. Gurney, who confined his attention to the improvement of the river bed, as also that of Mr. Walker, who proposed a solid embankment, to a uniform line, leaving recesses for the barges.

Mr. Page's proposal for the river embankment, as is well known, is to construct advanced terraces on each side, from Chelsea nearly to London Bridge, so as to confine the stream to an almost uniform width—about the same as it is at present between London and Southwark Bridges. These terraces will be from 6 to 10 feet above high water mark, and will communicate with the existing banks by adways, and from some of the bridges underneath which the terraces will pass. Where there are no wharfs the spaces between the terraces and the shore will be filled with a solid; affording space for gardens, as at Chelsea, Whitehall, Somerset-house, and the Temple.

The plan of this embankment is appended to the report of the Royal Commissioners, who propose that the reservoirs for collecting and purifying the sewage shall be formed by internal chambers, 22 feet wide, in the terrace embankments themselves, so that no land will have to be purchased. Between the embankment

walls and the wharfs there will be permanent docks or basins,—which may be entered both at half and full tide,—so that the accommodation at the wharfs will be much increased, whilst the narrowing of the river channel within the straight uninterrupted walls will considerably improve the navigation; and, lastly, the width of the terraces being 56 feet, facility will be afforded for the construction of carriage ways and railroads along the whole line, connecting, as it were, every suburb of the Metropolis at one common centre. There will be a few reservoirs placed in portions of solid embankment, at such outfalls as may also be necessary above Chelsea, and below London-bridge; besides similar works at the mouth of Hackney Brook.

The very moderate estimate for this stupendous undertaking, including the embankments and roads on both sides of the river, and all the necessary reservoirs and apparatus, is three millions and a quarter—being little more than half the outlay required for the scheme of the three Referees, for drainage alone, according to their own calculation, and not one-third on the estimate of their critics.

The importance of this work is admitted by the Engineers of the Metropolitan Board of Works, who in addition to their recent modification of Mr. Bazalgette's drainage plan (6th April, 1858), recommend the embankment of the Thames as a separate undertaking necessary for the purification of the stream; this advice being founded upon the opinion of Dr. Letheby, who writes, (15th March, 1858) "As to the proposition for embanking the Thames and narrowing the channel, so as to scour the bed, I believe it to be the most effective means of improving the condition of the river, and of protecting the public health; for the removal of the offensive mud, and the submerging of the river's banks, are, in my opinion, the most important of all considerations."

This comprehensive scheme of the Royal Commissioners for intercepting and disposing of the London sewage possesses one great advantage over all the other drainage plans, viz., that the ratepayers will not only have, but will see that they have something for their money; something, too, far superior to the improvements, grand as they are, now going on in Paris by direction of the French Emperor. Moreover, it may be urged that Government might fairly be expected to contribute towards the Thames embankment, this being a truly national work,—and pronounced absolutely necessary for the improvement of the river navigation, as well as the sanitative preservation of our great legislative bodies, by Mr. Gurney,—who is supported in his opinion by Messrs. Walker and Page, by the engineers of the Metropolitan Board of Works, and by Dr. Letheby.

Such is the plan suggested by the Royal Commissioners for disposing of the Metropolitan Sewage: a project which seemed to me to be so important, in a national point of view, as to demand the immediate attention of the scientific and philanthropic men who are accustomed to congregate in this hall; and the Council of the Society, with the urbanity for which they are distinguished, as soon as the matter was named to them, set apart this special night for the discussion.

It may, I think, be safely affirmed that no vested interests will be injuriously affected by the proposed river embankment. Seeing, however, the great propensity which exists in this country for setting up private against public interests, and the leaning of juries towards the individual against the mass,—whereby selfish men are often tempted to prefer claims to be exorbitantly compensated for temporary inconvenience, at the public expense,—it may be well to obtain power of purchasing any property along the line of works, relative to which differences may arise, the price to be settled by arbitration; the expense of such arbitration to be borne between the parties in an inverse proportion to the nearness of the award to the sums offered, and claimed, respectively. It is well-known that men will endure

mense temporary inconvenience and suspension of business in carrying out private improvements, for prospective advantages,—whilst, the moment that equal private advantage is promised by a public improvement, at much smaller present sacrifice to them, they will demand enormous compensation for alleged loss.

Let us, however, indulge in the hope that, if the plan now proposed by the Commissioners be found by impartial practical men to be effectual for all the purposes proposed,—and it is difficult to perceive any valid objection to it,—and, at the same time, calculated largely to contribute towards the convenience and adornment of this great metropolis, and, above all, to the health and enjoyment of its millions of inhabitants;—let us, I say, hope that no spirit of petty jealousy on the part of professional men; no mean parsimony on the part of financiers or rate-payers; no grasping avarice on the part of vested interests;—will be allowed to interfere with its cheerful, speedy, and thorough execution.

DISCUSSION.

The CHAIRMAN said Mr. Baker had commenced his paper with the remark that, apart from the ever rolling sea of politics, the subject which they were now met to discuss engaged, perhaps, the largest share of public attention and interest. He felt the truth of that remark, and was himself an illustration of it, for he had that evening quitted an unusually interesting debate in the House of Lords for the purpose of attending this meeting. It was true that the pleasure which the meeting afforded him was one inducement, but the great reason was the interest which he himself felt in the subject before them. He would first touch upon the steps that had been previously taken in reference to this matter, and then offer a remark or two upon the proposal which had recently been put forward by the Royal Commissioners, and which had been detailed by Mr. Baker. Now, the Metropolitan Board of Works had been, he believed, a good deal blamed for not having as yet proposed a scheme which was satisfactory, for the purpose of disposing of the sewage of the metropolis. Indeed, Mr. Baker himself had blamed—he would not say the Metropolitan Board only—but all parties alike, in that they had arrived at the year 1858 and were still “hammering at” the measure which, eventually he hoped would be completely hammered out. He (the Chairman) did not think that blame was justly deserved by anybody—certainly not by the Metropolitan Board of Works. We ought to recollect the position they were in. What did this Report of the Royal Commissioners say on the subject? It was a most able Report. He never read a Report with more satisfaction; it was liberal, and not tainted with prejudices of any kind. Wherever difficulties arose a fair confession of those difficulties was made; and where they could do so they made suggestions by which these difficulties might be overcome. What did the Royal Commissioners tell them? They told them this most important fact, that these difficulties had only come upon us of late years. All that the old Commissioners of Sewers had to do, was not to take away the refuse of London and dispose of it, but to prevent people from draining into the sewers. It was only in recent times that we had had to deal with the difficulties with which we were now surrounded. Therefore no board or boards were to be blamed if they could not all at once provide a plan to meet the increasing necessities of the case. He was not himself a member of the Metropolitan Board, although he had had a considerable share in the preparation of the act, but it must be remembered that this board was preceded by two or three other boards, and he could not say that what they proposed was more feasible than that which had been put forward since. He must say that the plan of expending several millions of money in carrying the sewage away to be thrown into the sea was a satire upon the age in which we lived, and

therefore he would not touch upon that subject, for he did not think it would for a moment enter into the calculation of those who listened to him. He would briefly proceed to notice the plan proposed by the Royal Commissioners. There was one important subject which had been touched upon in the report, namely, the state of pollution at which rivers generally had arrived—(not the Thames only)—partly from the sewage and partly from the residuum of manufactures thrown into the water. Now, Sir Benjamin Hall and himself had strenuously endeavoured to introduce into the *Removal of Nuisances Act* a clause to prohibit persons engaged in manufactures from disposing of the residuum by discharging it into rivers, unless they had used the best known means to prevent such residuum from polluting the water, but owing to the influence of powerful interests in the legislature they were defeated, and were compelled, after several divisions, to give up the clause. It was remarkable how much pleasure and exercise was afforded the poorer classes by the banks of a river. There was always something of interest going on—and if they went down the Thames on a fine day they would find the little public nooks leading down to the river's edge crowded with human beings. This was one reason why the plan before them, involving as it did the improvement of the river, strongly recommended itself to his mind. Then again, they had to deal with the continually increasing traffic of the streets of London, which was becoming almost intolerable. The amount of the traffic was so great, and the streets was so encumbered by those immense vans which rapidly injured the roadway, besides obstructing the thoroughfares, that this had a serious effect upon the amount demanded from the rate-payers for repairs; and he thought that, although they would have to pay heavily for the embankment of the Thames, the relief thus afforded to the traffic would effect an important saving in the rates, which should not be lost sight of. At the same time we were bound manfully and honourably to look the difficulties of the scheme in the face, and to note the disadvantages as well as the advantages. The disadvantage which principally struck him was this. They had in this scheme to deal with the difficult subject of the sewers themselves, which it was proposed to place within this embankment, and it was not stated whether the three and a-half million-estimated cost included these sewage works. There could be no doubt that a very large amount of valuable fertilising material could be precipitated by chemical means, and that as far as that went the problem was solved. If they could get the sludge separated from the water, the latter might be safely discharged into the river without being productive of any evil at all, for, even to the present day, it had not been proved that the discharge of sewage into the river had had any seriously bad effect upon the health of persons living in houses where proper attention was paid to ventilation. It was only the very poorest classes dwelling in wretched and ill-ventilated tenements, who suffered from the malaria generated from the deleterious substances discharged into the river. The great difficulty was, how to deal with the sludge. Two or three different plans might be suggested. They might follow that adopted at Leicester and other places. It might be desiccated and disposed of as manure. This was, he thought, the simplest process of all, but he could not say whether or not it was wholly unattended with nuisance. The Commissioners had stated that the sewage might be taken away in barges, or pumped up to certain districts where market gardeners and others would like to have it; but they had not given any estimate of the expense of steam power, or other necessary details. It was exceedingly necessary for those to whom the carrying out of this measure would be entrusted, to consider what would be the effect upon the river itself of confining it within new and narrower banks. Serious evil had resulted at Chester, a city with which he had formerly been closely connected. The embankment of the

river there was undertaken, and most favourable effects had been expected from it, but the result had been that the mouth of the river had silted up to such an extent, that now they were not able to get ships up to Chester except at very high tides. If the flow of the tide was impeded and a smaller amount of water was carried up the channel, the scour would be diminished to an equal extent. This would, however, be to some extent modified in the plan proposed, by having arches to admit the water into the docks where the barges could remain, and, therefore, perhaps what he had said was scarcely an argument against the plan of the Royal Commissioners. The sewage had become a serious evil in the present day, and in process of time would become still greater, and would be attended with more danger, and the safety of the population was a matter to be most carefully considered. It was his great desire to see places of healthful recreation provided for the toiling thousands pent up in cities, and he should indeed regard it as a halcyon day when the working people of this great metropolis should have abundant opportunity for open air exercise and recreation, and to promote that end he would do all in his power. Although he was a member of this Society, he was prevented from attending the meetings as often as he could desire, but he thought that the managers of it deserved well at the hands of their fellow countrymen, for having afforded facilities for the discussion of this interesting and highly important subject.

Mr. LAWRENCE PALK, M.P., said this was a question in which he had taken considerable interest, and perhaps he might be allowed to say a word or two upon it. He had read the report which had been so much alluded to that evening, and he must say a more excellent report he had never perused. He did not mean to say that with regard to some of the conclusions there might not be some doubt, but upon the whole he thought it had put the question of getting rid of the sewage of towns upon a more practical footing than it had ever been on before. The principle which predominated in that report was that of getting rid of the liquid sewage of towns by a system of irrigation of meadows, as practised with great success in the neighbourhood of Edinburgh, but there, as they would perceive by the report, complaint was made that a nuisance occasionally arose from the deposit of the sewage in the open ditches. The system of irrigation was by no means new in Devonshire, and, in fact, was almost peculiar to that county. They had had for many years a system of irrigating the meadows there by the springs that rose from the sides of the hills, the result of which, as regarded the crops, had been found to be extremely beneficial. The hon. gentlemen proceeded to read a letter which he had received from Mr. Campbell, of Rugby, detailing the results of some experiments he had made in irrigating with sewage water. Judging from the conclusions arrived at by the writer of that letter, it would seem that the irrigation of land with sewage might be carried on with profit to the town and with great benefit to the agricultural districts. The other leading feature of the report of the Royal Commissioners was the chemical deodorisation of the sewage by the means with which they were already acquainted. Being very anxious to test that plan by actual experience, he went to Leicester and witnessed the entire process under Mr. Wickstead's system,* and he could speak with the greatest confidence of its perfect success. He saw the process through all its stages, and he did not notice any particularly offensive smell; indeed the smell was not of a character to satisfy the critical senses of the agriculturists of the district in that respect. He was told that the lime used for precipitating the solid matters acted injuriously upon the fertilising properties of the manure, and that unless some means of fixing the ammonia were adopted, it would not be found of sufficient value to be really profitable. He thought

this was a question which was well worthy the attention not only of gentlemen connected with large towns, but also of those who, like himself, were connected with the agricultural interests of the country. If they looked to the increasing value of guano, and the difficulty there was in obtaining it pure, he thought it was important that science should be brought to bear, in order to retain for the use of the agricultural districts that which was the bane of large towns, but which was of such extreme value to the farmer. He therefore hoped that those in whose hands this great question was, would consider well before they sanctioned any plan which should pour into the sea as useless a material which might be made to be a great blessing to the country at large.

Mr. HAYWOOD said they were called together to discuss the plans proposed by the Royal Commissioners for disposing of the sewage of the metropolis. Before entering upon those plans, he would look for a moment at the conclusions which the Commissioners had arrived at, and which were stated in their report, and quoted in Mr. Baker's paper. That commission was appointed in January, 1857, and, after sitting for 12 or 15 months, it had arrived at nine certainly very satisfactory conclusions, and these conclusions had, doubtless, acquired considerable additional importance from having received the assent of that commission; but every one of them had been arrived at before by practical men who had carefully considered the question. There was not a single point of novelty in any one of these nine conclusions. The most important of them, perhaps, was the fourth, in which the Commissioners admitted that, after examining nearly all the places in the country where irrigation by sewage water was practised, their opinion was that, excepting under very favourable circumstances, it would not pay. That was a most important point. There was no novelty in it, but it would derive greater force by being promulgated through the authority of this blue book. The next conclusion was also an important one, as bearing upon the subsequent scheme, viz., that works for precipitating sewage matter might be erected in the vicinity of towns without inconvenience to the inhabitants; with that he quite agreed. The tenth conclusion required some explanation, as at present it was put in a very doubtful shape. With regard to the scheme itself, it was necessary that they should have it really before them before they could discuss it, but the report merely gave an outline—an idea of a scheme. It told them, in the first place, that sewage might be dealt with without fear of harm to the inhabitants of the city, and, secondly, that if the Thames embankment were carried out, the sewage works could be made upon that embankment. That, in fact, comprised the whole of the scheme now propounded, and, as such, he was quite unable to discuss it. There was an entire absence of all detail by which the probable cost might be estimated. They were quite left in the dark as to the number of the works, and as to their situation, because, he maintained, that there must be works established far beyond the line of embankment proposed in this scheme. He thought it was a fallacy to think of treating this question of the embankment of the Thames unless they were prepared to treat also of the question of compensating the persons who held property on the Thames. Parliament would never entertain a scheme, apart from compensation to the owners of the property which would be affected by the plan; and this would form a fearful item in the cost of the embankment. In the paper of Mr. Baker comparison had been made between the cost of this scheme of the Royal Commissioners and that proposed by Mr. Bazalgette, and partly by himself, which would be considerably increased if the suggestions of the government referees were to be attended to. It was useless to attempt to make a comparison between a scheme of which they had the whole of the details, and that of which they possessed none; but he must say this, that in every plan for the intercepting of the sewage, the

* See Journal, Vol. V., page 49.

question of the improvement of the arterial drainage must form an integral part. If this plan of the Commission was merely a question of taking up the sewage at its outlet, the estimates would then be formed upon entirely different premises, and no fair comparison could be made between them. The scheme of the Royal Commissioners was at present but a mere shadow, and as yet nothing had been put forward which could enable practical men to judge of its merits or demerits.

Dr. BARNES observed, that although the author had appealed in his paper to the "enlightened physician," he (Dr. Barnes) could not but feel that throughout the main-drainage controversy the medical propositions, which formed the very basis of all drainage schemes, had been taken for granted. The evidence of medical observers, who alone were competent to solve the fundamental question as to the effect of the Thames upon the health of the metropolis, had never been taken. The engineer and the chemist could not properly be called upon to produce plans and remedy an evil before the evil was proved to exist. He asked where were the proofs of the prejudicial influence of the Thames upon health? The opinions of Mr. Burk, of Dr. McWilliam—he might say of all those who had enjoyed special opportunities of observing the sanitary relations of the Thames, coincided with his own—that the Thames population was remarkably healthy. Fever and diarrhoea were less prevalent amongst those living near the river than amongst those at a distance from it. He must also insist that the principle of concentrating sewage in gigantic drains was radically wrong. The right principle was the very opposite one—to subdivide the sewage as much as possible. Mr. Haywood had shown the insurmountable difficulties in ventilating the sewers even in their present comparative simplicity, and surely this difficulty would be enormously increased by collecting the sewage into main-drains. We should be subject to the reflux of sewage gases into our houses with tenfold greater virulence. Mr. Goldsworthy Gurney's report had been much referred to, but he (Dr. Barnes) felt bound to point out that it displayed such misapprehension of some of the first principles of chemistry, that it ought to be read with caution. His opinion that sewage gases were propagated solely by virtue of the law of the diffusion of gases was directly at variance with observation. The sewage gases escaped into the streets and houses under the immediate action of currents, the force of which was demonstrable by the anemometer. In referring to the scheme of the Royal Commissioners, Dr. Barnes said it had been truly pointed out by Mr. Haywood that no complete plan had been presented by them. He was at first much disposed to agree with that report, but the difficulties urged by Lord Ebury and Mr. Haywood, now satisfied him that this report only added another argument to those he had been urging for some time past, in favour of a full and open inquiry into the whole subject, including the fundamental principles which had been overlooked altogether. At any rate, before committing the ratepayers to the execution of the plan as a whole, he advised that it should be adopted at first partially and experimentally, taking only one large sewer at a time.

Mr. HOLLAND felt with Mr. Haywood, that the plan of the Royal Commissioners was a mere sketch, and therefore we were not in a condition to do more than discuss the idea which had been propounded. Mr. Haywood had omitted to notice one very important feature in the question. The report of the Royal Commissioners started with the assumption, that the embankment of the Thames was a good thing *per se*, without any reference to the sewage question at all. If they assumed that this ought to be carried out on its own account, and was worth its cost, then Mr. Haywood's argument about that part of the cost did not hold good. He had no doubt the embankment would be a matter of enormous expense, and he was sceptical as to whether the benefits resulting from it would be equal to the cost it would involve; but

assuming this to be the case, then he thought no one could doubt that, so far as the disposal of the sewage went, this plan—if effectual—would be the cheapest that could be adopted. With regard to the question of disposing of the sewage profitably, there were various opinions upon that. He took it for granted that the sewage of London was too valuable to be thrown away; but, at the same time, he thought the expense of conducting it to where it could be brought to profitable use would be very great, and it would be difficult to persuade the public that it was worth while to incur such an expense under the idea of eventual profit. If we lived under an enlightened despotism, no doubt the thing would be carried out; but unfortunately, as regarded this question—though fortunately in other respects—the state of things in this country was very different, and therefore we must make the best we could of the matter. His impression was that they would lose so much time in persuading the public into the idea of conducting the sewage where it could be brought into profitable use, that it might be better to give this up altogether as regards London. What he disliked in this report of the Royal Commissioners was, that it seemed to imply a doubt, probably not intended, upon the profitable application of sewage matter in places where the objections which applied to the metropolis did not hold good. In most of the towns of England the sewage could be conveyed upon the land with very little expense, but London, lying at about the level of the sea, with an enormous amount of occupied land round it, presented a case of very great difficulty. The rendering of the sewage inoffensive was an easy thing enough, and was carried out perfectly at Leicester. He did not, however, agree with the hon. gentleman (Mr. Palk) that the process was entirely free from all offensive smell. At the same time the odour was not of an intolerable character, and he believed this objection might be still further modified, if not entirely done away with. He had been told that there was some invention by which the fertilising matters might be entirely precipitated from the sewage. He had heard this as much as twenty years ago, and was told of it again within the last few weeks, but he was still, as he had ever been, sceptical on the point. He did not believe this could be done; if so, the sewage question would be at once disposed of, and all further discussion would be needless.

Mr. FREDERICK DOULTON said they were discussing a question with respect to which they had in fact no data on which to come to a conclusion. They had no tangible plan before them to discuss, but merely the outline of a plan. He thought good would result from this report, although upon the question of the disposal of the sewage the Royal Commissioners had scarcely gone further than to condemn the proceedings of former Commissioners of Sewers and Boards of Works as radically wrong. That was the conclusion they had arrived at, and he thought if they had convinced the world at large of the difficulty and uncertainty which attached to the whole question, they had done great good, although they had not put forth a plan in sufficient detail for discussion. There seemed to be an uncertainty about this which did not attach to any other question. One set of engineers had estimated the cost at one million, others equally eminent had put it down at three millions and a-half, whilst others had mentioned eleven millions. As a member of the Board of Works he did not regret, but rejoiced at the delay that had taken place on this question, and he believed that good would arise if they were not hurried into a decision on so important a subject. In his opinion, further inquiry was necessary, not only as to the necessity of diverting the sewage from the Thames, but also upon the question of the large intercepting sewers proposed. They had a very striking illustration of what might be looked for in the carrying out of the larger scheme, in the Victoria-street sewer, which was to cost £4,000 or £5,000, but which had reached, he believed, £200,000.

When they recollected that the strata through which these proposed sewers must pass were of the same character as those in which the Victoria-street sewer was formed, they had some glimpse of the difficulty and expense that might be incurred.

Mr. PITTARD said, as the Medical Officer of the London Docks, he felt great interest in the question under discussion. The water in those docks having become extremely offensive in hot weather, he sought means to effect a remedy, and with that view he paid a visit to the Tottenham Sewage Works, and witnessed the process of deodorisation carried on there. The water that was discharged had the appearance of great purity, but having had the curiosity to preserve a little of it, he found after a few days its odour became intolerable, which, he thought, proved that the impurities, although temporarily suppressed, had not been really removed. Mr. Pittard made some remarks upon the present polluted state of the Thames, which was perceptible to all who made the passage of the river; and the odour being similar to that emitted from the gully holes of the sewers, he thought there could be no doubt as to its deleterious influence on the health of the population.

Mr. ROBERT RAWLINSON said, although the report of the Royal Commissioners had been termed an outline, or sketch of a plan, this was no proof that a plan had not been matured previous to this outline having been published. He believed he might pledge himself that, at the proper time, the full scheme would be brought before this Society, when all the facts and figures would be given. He might state that the estimates in the report were not matters of guess. The details had been fully worked out, and might, he believed, be fully relied on.

Mr. NICHOLAY (who had taken the chair upon the retirement of Lord Ebury at an earlier stage of the meeting), said they had a duty to perform to Mr. Baker by expressing their acknowledgments to him for having brought this subject before them; he would, therefore, propose a vote of thanks to that gentleman.

A vote of thanks was then passed to Mr. Baker.

TWENTY-THIRD ORDINARY MEETING.

WEDNESDAY, MAY 19, 1858.

The Twenty-Third Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 19th inst., J. Griffith Frith, Esq., Member of the Council, in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Rowley, Jonathan Sparrow | Cutler, George Octavius

The Paper read was—

ON THE ENGLISH SETTLEMENT OF THE HILL REGIONS OF INDIA.

By HYDE CLARKE.

The extension of English colonisation in India is a subject which has no reference to mechanics, like most of the Papers brought before the members, but it is one involving an equal claim on our attention, as coming directly within the purposes of our Society for the Promotion of Arts, Manufactures, and Commerce. It is one involving the stronger claim on our attention, because this is the only Society in the metropolis before which Colonial questions can be brought for discussion or investigation. This is a proud title for the Society, for it may indeed boast that it has in the century of its existence done very much for the advancement of Colonial interests, and thereby for the general prosperity of the

empire. Of all our Colonial interests, those of India, not commonly recognised as a Colony, are among the most important. Too long considered as the special province of a commercial company, India has scarcely received the notice it deserves as a constituent portion of the empire. Too long secluded by the jealousy of its administrators, and by difficulties of access—held up as a country which it was impossible for the outside Englishman to understand, and for which it was dangerous to legislate, India has been removed, as it were, from the pale of public opinion and the influence of public sympathy, until terrible events have made India the grave topic of the day. A fabric of administrative wisdom, which had received the highest praise and gained implicit confidence, has been shaken; a military system, which as it was flushed with glory and conquest, was thought to have surpassed in wisdom the Roman organisation, has exposed India to all the horrors of a barbarian invasion, and its soldiery have perished on the gallows or by the artillery of their own generals. A fearful conspiracy directed against those of our citizens and soldiers, our women and our children, who were resident in India, has by its atrocities harrowed our feelings, and excited our watchful anxiety during the vicissitudes of its crimes and its castigation. In the end we have reconquered India against our native army, by our own people, by the victories of the Lawrences, of Havelock, of Campbell, Outram, Inglis, Peel, of hero captains, and of hero soldiers—it may be said, of heroic and martyred women. What we have gained by our own hands, we can with the same help keep, and instead of governing India merely for a native soldiery and to uphold native prejudices and native vices, we may at length take a personal share in the welfare of India.

From the moment that the first English conquests were made in India, the question has naturally been entertained of the extension of English population there. This has occupied the minds of Clive, Hastings, Wellington, Munro, Bentinck, Ellenborough, Dalhousie, Canning, and, indeed, of every great statesman who has been connected with the country. Until a late period, although some may have wished for the introduction of such an element in the population, the prevalent disposition of Indian statesmen was, on various grounds, to exclude Englishmen from India. Still the question was never lost sight of, and several plans, general or partial, were brought forward for promoting such settlement.

The proposition of Sir Macdonald Stephenson, the chief pioneer of Indian railways, to connect Calcutta with the hill Sanitaria, by a branch line, was made before the revolt, and has been since supported. In support of this undertaking, I published a work on the Colonization, Defence, and Railways of our Indian Empire, in which the general system of hill settlement was laid down. The revolt breaking out suspended the railway projects, but its events afforded abundant confirmation of the justice of the system proposed, and the subject having been taken up by Dr. Archibald Campbell, the Superintendent of Darjeeling, Mr. J. Ranald Martin, the author of the standard work on the Climates of India, Sir C. E. Trevelyan, Dr. Hooker, the Himalayan traveller, Sir Macdonald Stephenson, Gen. Tremenhoe, Prof. Newman, Dr. Robert Barnes, and Prof. P. L. Simmonds, among others, and supported by the press in England and India, it had so far advanced in public opinion, that the member for Dumfries, Mr. William Ewart, felt justified in bringing it before Parliament, and pressing the matter with energy. It has obtained from the Government and the East India Company the concession of a Select Committee, which has been sitting for weeks, and has collected the most valuable evidence. What, at its first suggestion, was received as an absurd or chimerical proposition, is now acknowledged, under Mr. Ewart's auspices, as a most important measure, and in the recess it will have made such progress in India, that it will be ripe for legislation in the ensuing session of Parliament.

Such is the subject proposed to be brought before you this evening, and, thanks to this Society, this is the first public occasion, not excepting the debate in the House of Commons, which the advocates of this measure have had of fully explaining their views.

The word English "colonization" of India, although it expresses the idea meant to be conveyed, is however, open to misconstruction, and has been misconstrued, for, by attributing to it the idea of operations of emigration like those to Australia, it has been assumed that we propose to form agricultural colonies in the hills, and to send out agricultural labourers in masses. This misapprehension has been wielded as an argument against us, and as demonstrating the absurdity of our views, for want, perhaps, of better arguments against us. To avoid this misapprehension, it has been proposed to use the phrase "English Settlement in India," though it is not more precise.

It is as well to state that the advocates of the extension of English settlements in India are perfectly aware that much of the hill regions is as barren as the like districts in Switzerland or the Scotch Highlands, and they have never contemplated agricultural operations on such a site. What our supporters look for are results perfectly practicable, which are founded on experience, and are therefore the legitimate development of what has been already effected. We expect that, by placing a considerable English population, civil and military, in the healthy English climate of the hills, we shall form thereby a secure centre—not merely for the domination of India, but for its thorough civilization. While we shall have there a compact population physically and morally healthy, we shall be able to extend its influence on the plains, and, indeed, without this concentration, we feel we shall achieve but limited results from the small European population of the plains dispersed among the millions of India.

For the purposes of the investigation in which we are now engaged, we must consider India as including the neighbouring mountain regions and the northward frontier, more or less connected with it politically. This territory, so assumed, we may at once divide into two great portions, the countries of the hills and those of the plains, differing in climate, productions, and generally in physical conditions. The plains are capable of producing in abundance tropical crops, and teem with population; the hills are, to a great extent, barren, and, so far as they can be turned to account, afford the vegetable and animal productions of temperate climates, and they contain, likewise, valuable mineral deposits. The plains are generally unfavourable to European constitutions; the hills contain many sites healthy and with congenial climates. The hill regions form, therefore, the natural habitation for an imported European population.

Although factories had been earlier established, Bombay, acquired from the Portuguese in the reign of Charles II., may be considered the first English territorial possession. The terms of the charter granted by that king to the East India Company, and the institutions thereby established in the city, shew that it was contemplated to form there a settlement, like those formed at the same time in North America and the West Indies, with English laws, privileges, and institutions.* The Recorder's Court, which has merged in the Supreme Court, is an evidence of this implantation of English law in India; but, otherwise, this first attempt at settlement has borne little fruit, for the commercial and monopolising projects of the East India Company and their political exigencies long closed India to English enterprise, nor was it till of late years that these restrictions have been, by piecemeal, relaxed, and now, though the enactments are consigned to the grave, their ghosts are not laid.

* Of this early occupation some interesting details will be found in the appendix to the second volume of the Viscountess and's "Chow-Chow."

In the last century, our great Indian empire was formed by conquests in the plains of Bengal and Madras, and, for the first quarter of this century, our empire was extended chiefly in the regions of the plains. Later events have made us masters of the Neilgherries and the long western coast range, have given us a domination over the mountains and table-lands of Central India, and have extended our bounds within the Himalayan system at many points, from east to west.

At first, the governors and authorities of Bombay began to seek the neighbouring mountains as an occasional refuge in the hot season; then the district of Poona became a residence more or less permanent. Slowly the Neilgherries were resorted to by invalids, and, at length, by the Madras authorities. Bengal was later in this history, because Calcutta, its chief seat, is many hundred miles from the hills. The extension of the presidency, and the formation of sub-presidencies to the west, have led to permanent establishments in the hills.

The hills were first resorted to as places of occasional and temporary retirement from the tropical heats; then a few wealthy invalids sought relief, and the advantages of the climate being acknowledged, the Indian government established the Sanitaria, and thereby laid the foundation of that system of permanent English settlement now in progress, and which it is sought to promote. These, in the first instance, were slowly and sparingly formed as depots for invalid English soldiers, but with the intention of making them permanent stations for a portion of the English force. Practically, this intention has not been fully accomplished, for Darjeeling has never had a battalion cantoned there, and the troops in the west have, the most part of their time, been engaged in the several wars in the valley of the Indus. Still, at the outbreak of the last revolt, it was from the hill stations that the freshest troops were sent for resistance to the mutineers.

These Sanitaria have been so successful as invalid stations for civilians, officers, and soldiers, that they have been adopted as a permanent institution of the armies of Bengal, Bombay, and Madras. There being many persons in easy circumstances among the civilians and officers, shopkeepers and other settlers have been induced to resort to these stations. Still they form but very small towns, although such a place as Simla may on the visit of a Governor-General have twenty thousand people flock into it.

The tea cultivation, singularly enough, has been an auxiliary to this hill colonization; for being suited to the neighbouring districts, admitting of European superintendence, and having been found successful, tea gardens are spreading in Assam, Darjeeling, Sylhet, and elsewhere in the northern regions.

The history of English settlement in the plains is brief. At Surat, Bombay, Madras, and Calcutta, an English mercantile population on a limited scale naturally grew up, and at the three latter ports has of late years become important. Throughout India the English civil and military servants of the Government, relatively few in number, are to be found. The only independent English population in the interior consists of the indigo planters, a fine body of men, of healthy habits and independent bearing, and whose healthfulness is by themselves attributed to their habit of spending much time in the open air. At the large stations are a few shopkeepers. Throughout India, from thirty to forty thousand English soldiers are dispersed. Most of the wealthier English are married to English wives, but their children are sent to the hills or to England, and India is not chosen as a permanent abode. There is a small body, however, of white descendants of the soldiers, and of Eurasians and half-castes, who are the only permanent representatives of the occupation of India by the English race, and very unfavourable representatives too. While the Mahomedans of immigrant or indigeneous blood

form a seventh or sixth of the population, the Indo-English do not form a ten-thousandth part of the population of India.

The causes which have impeded English settlement in India have been—1st, the expense of transit; 2nd, climate; 3rd, legislative prohibitions; 4th, the imperfections of the governmental system, and the indifference or hostility of the administration.

As there have been very few passengers yearly to India, the rates have been high, and the accommodation for the lower classes of passengers inferior. The rates paid by the government for the conveyance of troops are, however, moderate enough, and with the flow of a regular traffic, intermediate and fore-cabin passengers could be carried at Australian rates, more particularly as there is a large mass of tonnage regularly employed in the Indian trade.

Internal transit was heretofore in a very unfavourable state, but with the late spread of river steamers and of railways, a settler can be quickly and economically conveyed to the hill regions, or the chief cities of the plains.

By the simple organisation of an emigration department, arrangements would be made which would place India within the reach of the small capitalist and the mechanic, as Australia is.

Second, as to climate. It must be observed that the hill regions are only now becoming available, but that there is already scope for settlers in the hill towns. With regard to the plains, they are favourable to persons of temperate habits engaged in out-door pursuits, but unfavourable as a general principle for mechanics and persons of sedentary habits who would resort to the towns. The refuge of the hills, however, now allows Calcutta and the other cities of the plains to be occupied by Europeans, as New Orleans and the cities of the Lower Mississippi are. Of the hill climates all that need be said is, that they are as healthy as England, and that relatively to the plains the deaths of European soldiers are only as one to two.

Positive prohibitions formed the third head referred to. These were levelled first at the entrance of independent Englishmen into India, and next to their acquisition of land or enjoyment of political privileges. These have all been abolished.

Although the positive prohibitions to English settlement are abolished, settlement cannot be said to be favoured from various causes, which have yet to be remedied. The first of all is, that an Englishman in India finds himself in the only part of the empire where he is deprived of the rights of citizenship and of self-government. This is maintained by some authorities under the plea that to allow an Englishman English rights in India, is to give him an advantage over the native, which is alleged to be unfair, because the natives, in a mass, cannot on any sane political grounds be endowed with English rights at this time. The injustice of depriving an Englishman of his rights within his own territories, is not regarded by these lovers of native rights, whose real object is to reduce the Englishman to the same jurisdiction of the English and black civil servants, to which the native is subjected. The genuineness of the objections can, however, be tested in a very simple manner, for surely it would be better to elevate the Hindoo than to depress the Englishman. Inasmuch as Hindoos have hitherto been exceptionally governed by Hindoo law, Mahomedans by the Koran, and the English at the presidency towns by the Supreme Court, it is no more exceptional that Englishmen shall be governed by English law throughout India. The natives can be elevated in mass by the gradual improvement of their own institutions, and individually, those possessing a knowledge of the English language, and the other qualifications required, could be allowed to obtain English citizenships and English privileges. Thus the whole country would be gradually raised to a higher standard, instead of the best part of the population being debased beneath their

own standard to a very low one, for a low one is that which, depriving an Englishman of the verdict of his peers, places him at the mercy of corrupt native judges and officials, and corrupt and perjured witnesses, evils if not inseparable from the native character, at any rate such as cannot rationally be expected to be remedied in the present generation.

The land regulations are radically vicious, for however the subject may be mystified, it remains as a positive fact that there is no freehold tenure throughout India, but a kind of copyhold or, at the best, a tenure in petit serjeanty, or on chief rent at the mercy of the Court of Exchequer, a system of tenure common enough in the middle ages, and which, on account of its vices, has been abolished throughout Europe, and a freehold tenure substituted. To demand a freehold tenure in India, is not as represented to demand the abolition of the land-tax or exemption from taxation, but simply to demand the application of justice and common sense. To take the example of Canada, the quit-rent system has been abolished, the exactness of the seigniorial (or zemindarial) tenures has been provided for, but land-tax for general and local purposes is regularly levied. There is no valid reason why in any part of India, by judicious regulations, the land tenures should not be corrected, even in Bengal, where all the privileges of private property, as against public rights, are now claimed for the zemindar. The zemindaries may be divided up, a power of enfranchisement from zemindarial rights granted to tenants, and the benefits of measures correspondent to the Encumbered Estates and Copyhold Enfranchisement Acts be conferred on the resident population. The East Indian government has been liberal in the grant of lands under quit-rents for tea plantations, but nothing short of a free system will secure the development of English enterprise, and the advancement of the native population.

The administration of justice, as already intimated, is repugnant to English notions. The English magistrates are very few—in some places one to a million of people—they are frequently removed to other parts—their native assistants are inefficient—and as to the police, it is admitted on all hands to be defective. The scarcity of magistrates renders justice dilatory, and favours injustice, and the police are looked upon as instruments of oppression and accomplices of vice. The number of magistrates, it is acknowledged, must be increased, and the police put under English superintendence. With the progress of English population, justices of the peace may be appointed from the English and qualified natives, as in the colonies.

The centralization of the Government, and the want of municipal institutions, is another obstacle in the way of the settler, and which a more numerous English population can best remedy. Then municipalities may be granted to the towns, and the county magistrates carry out the district administration.

To the covenanted service, a body of superior civil servants in India, has been awarded by many good authorities the praise of being the best educated and ablest administrative body in the world; but so far as English settlers are concerned, the government functionaries have acted rather by way of discouragement than of inducement. It is not that there is any positive legislative restriction in the way of the settler, but he is deprived of his rights and placed at the mercy of the government judicial and revenue officers, whose wish is to place him on a level with their native dependents. A spirit of cliquism keeps the settler outside the magic circle. The one or two civil functionaries, and the three or four military officers of the station, treat him as an inferior; the natives may annoy him without fear of discountenance, and, indeed, in many parts of India, the relation of the Englishman to the community around him, is not much better than that of the free black in the slave states of America. The indigo planter, by English spirit, may, in the long run, discomfit the Zemindar.

dar, and keep the native officials and police in check, but he may be subjected to annoyance, pilfering, and loss to no small extent. So long as the governing body form a caste apart, no education and no talents will redeem the free settler from a position of undue dependence, and nothing short of his participation in the administration of justice as in other colonies, will secure him fair play, and, in the case of India, advance the condition of the local population.

Whatever local circumstances may be alleged as affecting the political and administrative arrangements of the lower districts, in the hills the population is scanty, and without any political claims, and it is perfectly practicable to afford the English settler full English rights, and to place the local population under English law and administration.

The inquiry now in progress in the House of Commons is making known the true state of the facts as affecting the English settlers, and the result must be at an earlier or later period to remedy all the evils complained of, and although for a time the prejudices of the governing caste may be shocked, in the end their patriotic instincts will prevail, and they will themselves be assisted to carry out to a far greater extent than they have yet been able, the many noble measures they have framed for the welfare of the millions under their charge.

If we look to the present condition of India, great as may be the misery of many districts and of many classes of the population, it is undeniable that great improvements have taken place throughout the country. The administrators have shown an earnest desire to purify the Courts of Justice; they have abolished suttee, infanticide, thuggism, gang robbery, and other abuses, and they have greatly contributed to the security of property and the safety of life and limb. All this is purely owing to English influence, to the influence of the civil and military functionaries.

If we look at the commercial advancement, it is likewise to be attributed to English influence, either of individual enterprise or assisted by government co-operation. Take, for instance, the indigo cultivation, which has created a great staple for India; then the commerce in cotton, which produced a few thousand pounds in the last century, and has been raised to a hundred million pounds, exclusive of exports to China.* The opium trade is another great resource for India. The culture of sugar has been improved and extended, so likewise has that of silk. Rice is an article of large trade to England and China. Jute is a substance hardly known a few years ago, except as dunnage, and which is now a valuable raw material.† The seed oils have of late years suddenly sprung into commercial importance. Sheep's wool and goats' hair, which were trifles, every year are exported in greater abundance.‡ Teak, for shipbuilding,

had its established place in the English market. Tea must again be named as a growing export. All these branches of commerce are the results of English enterprise, and were it not for English exertions they would have remained barren.

These are unmistakable results, to be proved by the official tables of trade and shipping, but within the country the same influence is at work. Steam navigation has been introduced on the coasts and rivers, railways have been begun, telegraphs are laid down, coal mines are opened, gas is manufactured, the rivers are spanned by the suspension bridge, and indeed every improvement of Europe and America has been naturalized in India, which has been thrown open to the free commerce of the world.

Looking at these facts we assert that the English element is the chief one in the advancement of India, the whole experience of the past proves it, and we call upon the public, and we call upon the legislature, in the interest of England, and the interest of India, to take measures for the infusion of English blood into the country.

One of the first steps towards this is, we assert, the encouragement of the hill settlements, and of English emigration to those districts, and thereby as a certain result increasing the number of English settlers in the plains.

The districts available for occupation we may broadly assign as the whole frontier region of the Sub-Himalayas and its extensions, from Assam round to the limits of the Punjab, including Cashmere and Nepal; the ranges of Central India on each side of the Nerbudda; and the Western Ghauts with the tablelands adjoining it and the Neilgherries. Whether the Burdwan range can be advantageously occupied is yet matter of research.

The higher mountain sites, which are best adapted for towns, garrisons, and permanent residences, are in many cases destitute of immediate agricultural resources, but in other regions there are large districts near at hand, available for all the productions of temperate or semi-tropical climates. Such are Cashmere, Mysore, and extensive districts in the Dekkan. Where centres of settlement have been provided, the English immigrants will spread as they have done in Ceylon, and, instead of India, as a whole, being regarded as inimical to English constitutions, it will be found that the greater part of it is readily accessible to enterprise, and an immense extension of production will take place. Then shall we see coffee under English capitalists as in Ceylon, sugar as in the Mauritius and Natal, and cotton as in Louisiana.

Parimath, in the Burdwan range, has been pointed out for settlement by Sir Macdonald Stephenson and others, and if this can be done, another healthy station will be found for Calcutta, in a country affording great mineral resources in coal and copper mines.

Assam is a district acquired of late years, in which the establishment of the tea cultivation has brought it under European superintendence and influence. In this remote country the Assam Tea Company and many private individuals have founded tea plantations, and to such an extent that the crop of the company alone in the year 1857 was 710,000 lbs. Many parts of Assam are unhealthy, but there is the choice of sites, and as there is abundance of new land, and sufficient cheap labour, new factories are springing up, houses with galvanized iron roofs are raised, and steam-boats are run on the Burrampooter.* In these villages and tea stations many English residents are to be found, and there is ample scope

at £8 per bale, so that the 1,397 bales imported in the year 1836 may be put down at £11,176. And, during the next 22 years has increased to the extent of—57,985 bales, worth £463,380.

* See the *Illustrated London News*, August 15th, 1857. quoted in "Colonization, Defence, and Railways in India."

* John Chapman, "Cotton and Commerce of India."

† See P. L. Simmonds, "Commercial Products of the Vegetable Kingdom;" and likewise P. L. Simmonds, "Dictionary of Trade Products," for this and other articles.

‡ My friend, Mr Daniel Hazard, has favoured me with the following return of the Indian wool trade.

An Account of the Number of Bales of Sheep's Wool imported into the Ports of the United Kingdom, from Bombay, during the following years:—

1835	1,397 Bales.	1847	8,123 Bales.
1836	3,493 —	1848	16,923 —
1837	5,665 —	1849	11,041 —
1838	6,117 —	1850	9,704 —
1839	5,874 —	1851	12,596 —
1840	7,611 —	1852	22,130 —
1841	10,563 —	1853	35,540 —
1842	11,876 —	1854	43,540 —
1843	6,594 —	1855	42,029 —
1844	6,741 —	1856	47,264 —
1845	10,065 —	1857	57,985 —
1846	11,279 —		

(Average Weight per Bale, 334 lbs. gross.)

N.B. The average value of East India wool may be estimated

for enterprize. Besides tea, sugar, rum, lac-dye, timber, and caoutchouc, are articles of English trade.

Cachar, one of the divisions of Assam, produces tea of good quality. A company has been formed, called the "Cachar Tea Company," and there are a score of other tea-plantations. The war alone has stopped the influx of Europeans. The military duties are performed by hill-natives, called Kookies.

The Durrung division of Assam has two tea establishments, a lac dye manufactory, and a military church. Lac-dye is one of the articles to which English enterprize is now being extended.

In the Gowalparah division of Assam, the English have engaged in the timber trade, and are working the forests of the uplands. Here, as in other parts of Assam, English schools are established.

Ramroop, or Gowhatty, has several English establishments for tea, timber, the manufacture of caoutchouc, lac-dye, and rum. There is a station of the American Baptist Mission. The troops are native, consisting of Assam Light Infantry, of which there are two regiments. Throughout the hill stations it will be observed that the natives have become readily associated with us, and consisting of tribes of distinct origin, and having no sympathy with the people of the plains, can be safely enrolled, and have rendered considerable services during the late commotions. Thus they are induced to value the English alliance, and are trained up as good subjects. Caoutchouc, it will be seen, is, in this district, a result of English enterprize, as are the products of the forests hitherto unutilised.

The Luckimpore, or Debrogurh division of Assam is one of the tea districts, and there are tea gardens at Chubwa, Dikkun, Myjaun, Disraalle, and other places; one of these companies or firms employs three English assistants. There is a church.

Nowgong, in Assam, is a tea and sugar district. There is an American Baptist Mission Station—Assam being one of the districts in which the American Baptist Society co-operates with us for the civilisation of the natives.

Seebaungur is the great tea district of the Assam Company. They have here five tea-gardens, and employ fourteen English, including a civil engineer, a surgeon, and an accountant. The American missionaries have, besides chapels and schools, a girls' boarding-school, and a printing-press, from which is issued a monthly paper in Assamese.

The Golaughant district of Seebaungur includes tea-gardens and sugar works.

Throughout Assam is a considerable native population, available for the supply of labour, and it has the advantage of the large navigable stream of the Burrampooter, with its steamers, as an outlet for commerce, communicating, though by circuitous routes, with the port of Calcutta.

Attached to the Assam Government or Commission is that of Sylhet. The productions of this district include coal, iron, limestone, timber, lac, caoutchouc, wax, honey, betel nuts, oranges, cassia, tea, and cotton. It will be observed that these are chiefly mineral and forest products, affording good scope for the application of capital and enterprise in obtaining the raw products, and in preparing them for the market in the first manufactured state.

Sylhet is a hill country, which has likewise been occupied for tea plantations, and a sanitarium has been formed here, named Chirra Ponjee, but the climate, though not unhealthy, is very wet. It was selected as a European station on account of its elevation and healthiness, and is on the high road from Sylhet to Gowahatty.* The neighbouring wild tribes of the Kasia and Garrows gave some trouble at first, but the settlement was formed.

It is on a flat table-land, three miles long and two broad, and where the settlement is it is bleak and barren, with scarcely a shrub or tree to be seen, except clumps of the screw pine. The low white bungalows are few in number and very scattered, and there is a church. For this barren aspect the views from the margins of the plateau are a compensation, and are described by Dr. Hooker in glowing terms for their magnificence. The climate is so wet that Dr. Hooker recorded thirty inches of rain in one night, and Mr. Yule, 264 inches or 22 feet in the month of August; thus the little streams about Chirra will rise fourteen feet in as many hours and inundate the whole flat; but the natural drainage is so complete that it actually makes the soil sterile. Coal, however, is very cheap, so that the residents have protection indoors against the damp. Under these circumstances, Chirra has gone out of favour, and given way to Darjeeling as a sanitarium for Eastern Bengal, but it has several residents, and a church dedicated to St. Bartholomew. In the district of the Cossyah and Jynteah hills are the mines of the Sylhet Coal Company, and limestone is likewise wrought for the supply of lime to the low countries. The mines of the coal company are at Larkabong and Chirra Ponjee. The coal is described as of good quality. At Sylhet is the church of St. Michael, and at Sheik Ghaut, in the neighbourhood, is an establishment of the Welsh Missionary Society.

One of the most remarkable events in connexion with Sylhet, is the discovery, as proclaimed by the government, that the tea plant is indigenous in the pergunnahs of Ruffeenuggur, Chapghat, and Paunchkhund, the trees having been found to the number of many thousands, almost entirely on waste jungle-land in Ruffeenuggur and Chapghat, and on the teelas or detached hills, 400 or 500 feet high, in Paunchkhund. As this land is all unsettled, the government at once issued regulations, offering it liberally for settlement in grants of not less than 500 acres free at first, and with a gradually increasing quit-rent, grants of hill forests being on special terms.

Darjeeling is one of the most important places in connexion with the English settlement of Bengal. Lying due north of Calcutta, with railway and steamboat communication, open or in progress half the way, a small amount of enterprize will bring it within a few hours reach of Calcutta. Its advantages were first discovered about the month of February, 1823, by Mr. J. W. Grant, of the Civil Service, at that time resident at Malda, and by Captain, now Major-General G. W. A. Lloyd, who were employed in settling the boundary between Nepal and Sikkim. These gentlemen represented the facts to the Governor-General, Lord William Bentinck, in 1829, and that great man, it is said, never lost sight of the expediency of establishing on this tract of the Sikkim hills a station for the relief of those whose health demanded relief from the heat of the Bengal plains. He directed Major Herbert, Deputy Surveyor-General, to explore the site, and the results having been brought before the Court of Directors, they highly approved of the plan, and extended it with a view of its forming a depot for the temporary reception of English recruits, and even as a permanent station for a European regiment. This undertaking likewise received the fostering care of Lord Auckland during his government, as also of the successive deputy governors of Bengal, and of the present Governor-General, Lord Canning.

The situation of Darjeeling is in a spur of the Great Sinchal mountain, which itself rises nearly to a height of 9,000 feet, throwing out several spurs. One of these is Darjeeling, a hog-backed ridge, with a steep descent on its eastern side to the torrent of Rogno, and on the west and south-west declining in more gentle declivities, broken into knolls, and intersected by numerous streamlets, and forming a fine amphitheatre, extending from two to three miles, and dotted with villas, military establishments, the civil offices, the church, hotels, and other buildings. On other spurs are several neighbouring villages and hamlets, for Darjeeling has already become a

small centre of colonization. In the neighbourhood, nearer or further off, are Gnadenburg, the German mission, Hope Town (an English settlement), Leebong, Jelapahar, Tagoar (the tea plantations of Capt. Masson), and Kurison.

The great attraction of Darjeeling to visitors is the noble view of Deodhunga, 29,002 feet high, of Kunchinginga 28,176 feet high, and some of the highest peaks of the Himalayas, affording perhaps the grandest scenery in the world. Thus, in the future of Darjeeling is its situation as one of the chief places of resort by the Indian traveller.

Darjeeling is a small place, according to English notions, and is little more than a village, but is rapidly growing in importance. It has a church, Baptist and Roman Catholic chapels, nunnery, boarding and other schools for boys and girls, public library, masonic lodge, hospital, treasury, jail, hotels, and various shops. It is one of those places to which English children are sent for education, and there they get the rosy cheeks of old England. There are numerous residents for health occupying the villas. The military establishment consists of a hill corps, a body of English invalids, and this year cantonments are prepared for an English battalion.

The neighbouring district, a part of Sikhim, now belongs to the English, and includes a population of 50,000, available for labouring purposes. The remaining district of Sikhim is dependent on England, and can be likewise occupied for settlement when the necessity arises.

The great value of the Darjeeling and Sikhim territory arises from its lying between Nepaul, Thibet, and Bhootan, on one of the natural routes to Central Asia, commanding the trade on the eastern frontier. The produce and exports from these districts include gold-dust, iron, copper, lime, woods, tea, wax, ginger, catechu, cassia, coffee, cotton, hemp, gunny, rice, cardamoms, oranges, potatoes, ghee, hides, horns, musk, wool, chowries, blankets, woollen cloths, and many other articles.

As a political position, it commands the countries referred to, and prevents the Nepaulese from seizing Bhootan, which they are anxious to do, and whereby we should have those dangerous neighbours, the Goorkhas, now our allies, spread further along our frontier.

At present we have but a small share in the trade of Central Asia, Chinese tea being brought from 2,000 miles off close to our border, Russian woollens and manufactures being likewise imported to Thibet.

The rise of Darjeeling, and the attention which it now attracts as an advanced post for the promotion of English influence, is chiefly owing to the exertions of Dr. Archibald Campbell, the superintendent or governor, who is one of those remarkable men to whom we are indebted for building up and preserving our Indian empire. Campbell has done on a small scale what the Lawrences have done with the kingdoms under their rule. A small outpost he has made a province; he has subjected the neighbouring rajah, promoted agriculture, created commerce, encouraged settlers, and enlisted troops. In the late disturbances, by his influence he raised considerable recruits among the Goorkhas, held his own, and afforded assistance to the superior government. He has introduced the culture of tea and other articles, and has made important experiments on cotton in the lower districts. There he has succeeded in growing the sea-island cotton, and is now prosecuting further trials. He has been very active in promoting roads and the railway, and has lately again called the attention of the Supreme Government to the trade with Thibet.

In 1849 I proposed to extend the telegraph to that station, a measure since approved, and Sir Macdonald Stephenson afterwards projected an extension of his East Indian Railway in this direction. Last year we brought this subject before Mr. Campbell, who has done much for its prosecution. It will be observed that Darjeeling is about 375 miles north of Calcutta, that the East

Indian Railway proceeds north-westerly, as far as far as Rojinahal, and that consequently the branch to give Calcutta a complete northern line and connect it with Darjeeling is under 200 miles. The name of the company for the new line, is the Northern Bengal Railway Company, which is now in communication with the Indian Government for obtaining the necessary authorization. The Government have received reports in favour of Darjeeling as a situation for English settlement, and have sent out to obtain the opinion of the local authorities as to the best means of encouraging a railway or tramway.

This railway will produce the most important results in Bengal, for while it will enable English and hill troops to be poured down on the plains, it will, on the other side, give to the inhabitants of Calcutta the climates of England or Switzerland, which, in a few hours, and at a small expense, they will exchange for that of the tropics. Only a few years ago the total charge of a first-class traveller from Calcutta to Darjeeling was £25, and the time employed seven days. This has been now much abridged, but the difficulty of access is still the chief obstacle to the progress of Darjeeling, and until the railway is opened throughout it must linger. Then an emigrant passenger will be carried up in a day for sixteen or seventeen shillings.

Passing from Darjeeling, the range of the sub-Himalayas, containing some fine valleys, and country available for settlements, is in the possession of the Nepaulese, and is for the time closed against us. We then come to a group of hill countries, including Kemaon, or Almora, the Dehradun, and Simla.

Kemaon or Kumaon includes the districts of Kemaon or Almora, Gurhwal, and Nynsee Tal. This country has attracted attention for its iron mines.*

Almora has an English population as well as a native one. Here is a considerable establishment.

Hawulbagh, five miles distant, has, however, the chief residences, and here are the military cantonments. In the neighbourhood are tea plantations.

Gurhwal has many iron and other mines, but the produce is very small. The forests are under Government supervision. The chief town is Sreenuggur.

At Paronee, in Gurhwal, are tea plantations.

Nynsee Tal, in a romantic situation, by the side of a lake among the hills, is the favourite sanitarium in Kemaon. It has been a city of refuge during the troubles.

Bheen Tal is a village, with tea plantations.

Dehradun or Deyrah Dhoon is a district about the size of an English shire. The town is delightfully situated, and is in a good route for trade. The neighbouring country is fertile, but, where uncleared, most unhealthy from rank vegetation. In this district an experiment was made of colonization by invalid soldiers and Portuguese Hindoos, and as it failed as a matter of course, as all military colonies have, and as the Portuguese of India are sure to fail, it is now set up as a stock argument against English settlement in India. The spread of the tea cultivation alone is answer enough to the Dhoon experiment. The town has a church, American Presbyterian, and Roman Catholic church, and a variety of public establishments, among which is a station of the Great Trigonometrical Survey of India. The forests of the Dhoon are of importance, and are under government superintendence.

Landour, near Dehradun, is a sanitary station, regularly frequented by the Meerut officers, and forms a considerable town with military and civil establishments. There are a church and Roman Catholic chapel.

At the village of Woodstock is a Protestant girls' boarding-school.

* See Report on the Metalliferous Deposits of Kumaon and Gurhwal, by W. J. Henwood, F.R.S., and Tramroads in connection with the Iron Mines of Kumaon, by W. R. Andrew.

Mussoorie is so close to Landour, that the towns or villages are almost connected by the rambling villas; it has a church, and there are a Roman Catholic chapel, and a very well conducted Roman Catholic school, or rather college for boys. A nunnery is another Roman Catholic establishment, with a boarding school attached. It will be observed in surveying the hill towns, that the Roman Catholic missionary authorities have very skilfully selected them for occupation by churches, nunneries, and boarding-schools, and as the cost is paid by the pupils from the plains, these become reproductive establishments. At Mussoorie there is a superior church school for boys, and there is a common girls' school, besides two boarding-schools for young ladies. Dancing and music are taught in this remote region. Beer is brewed from native barley at this place, and forms a new and permanent branch of trade.

Kenilworth and Clarkeville are places at Mussoorie.

Simla is at present the most important of the hill towns, and is so far metropolitan that it has been the frequent residence of governor-generals, lieutenant-governors, commanders in chief and high authorities. Like most of these sanitariums, it is perched on a narrow ridge of mountains with dwellings scattered on every available spot, often of narrow area. It was only in 1819 that the first English dwelling was erected here by Lieutenant Ross, but by 1841 it had become a regular English town, and has since much increased.* Sometimes some twenty thousand persons are temporarily assembled, when the Governor-General takes up his abode in the town. In Simla and the neighbouring towns and villages, are to be found many residences. Christchurch is a costly edifice with an organ. There is a Baptist chapel. There are boarding-schools for boys and girls, and five district schools of the Church Missionary Society. The local governor, called a commissioner, is provided with numerous functionaries and establishments. This is one of the few places in India which has a municipality, and the only one which has an English municipality, an institution which it is to be hoped will rapidly extend throughout India. There are an observatory, large dispensary, bank, library, hotels, assembly rooms, type, copper-plate, and lithographic printing-house, and many shops.

Boileaugung is a village near Simla, named after a distinguished engineer officer, General Boileau.

Jutogh is the military station near Simla.

Kotgur is a town 50 miles north of Simla. Here are a Church Mission, a boys' and girls' school of the Church Missionary Society, a school of industry, and station of the Moravian Missionary Society. In the districts are five boys' schools. The Moravian Missionaries have chosen this as a temporary residence, in order to penetrate the interior from this point, and establish missions among the Tartars and Mongols. The tea cultivation has been successfully introduced in this district.

Kusowlee, in the Simla district, is a sanitary station, having large establishments, but suffering from the want of water, which has to be brought from a mile and a quarter distance. The buildings are distributed around a hill of five miles in circuit. There are a church and Roman Catholic chapel. Here is the residence of another Commissioner. A brewery has been successfully established here likewise.

Sanawur, near Kusowlee, is the seat of a most interesting establishment, the Lawrence Military Asylum. This was founded by that great man Sir Henry Lawrence, and is one of the munificent foundations of that noble family. In 1856, it contained 200 boys and 200 girls, orphans of English soldiers, who, among other employments, are taught printing, bookbinding, and

electro-telegraphy. It is likewise the Military Normal School for training schoolmasters for the Bengal army. Dugshaie in the same region is a station of Sirmoor, having an established church and a Roman Catholic Church. In the district a hill regiment is raised. The place is 16 miles from Simla.

Soobathoo, another of these towns, is by some preferred to Simla. The population is chiefly composed of native immigrants and refugees from the hill states. There are a church, American Presbyterian Chapel, Roman Catholic Chapel, and Masonic Lodge. It is a sanitarium, and one of the most healthy stations for troops. In the neighbouring valleys and steep mountain sides, cultivation is industriously carried on, the produce being rice, maize, wheat, barley, millet, ginger, cotton, opium, tobacco, oil-seeds, red pepper, hemp, vegetables, apricots, peaches, walnuts, apples, wild pears, raspberries, strawberries, and melons, being the varied growth of several climates in close neighbourhood.

To Simla and Soobathoo a railway has been proposed from the main lines, but it languishes at present in consequence of the disturbed state of the neighbouring parts of India. Railway communication, however, once established, these military regions would pour down large supplies of troops, fresh and vigorous, as they have done small bodies for the wars on the frontier and for the present intestine war.

The great group of what may be called for the purpose the Simla military towns, is among those which afford the smallest resources for agricultural operations or other enterprise, but the trade consequent on the provision of troops and the gradual development of industry, will hereafter invite many settlers.

We now come to scattered towns, of much later establishment, being the military sanitariums lately formed by the Lawrences and other administrators on the hills adjoining our most western territories in India.

Murree is on a hill between the rivers Indus and Jhelum, in the Punjab, established in 1851. Here of late was the seat of the great Governor, Sir James Lawrence, one of the saviours of the empire. It has already a large population, and includes a military depot, church, the revenue survey department, and many villas.

Dalhousie is a sanitarium and hill station in the Punjab, in the Chumba hills, 120 miles north-east from Lahore, founded quite lately for the Sealkote and Lahore divisions, and named in honour of the late distinguished Governor-General.

Dhurrumsala is another Punjab military sanitarium, with church and small barracks. Here the tea cultivation has been introduced.

Kyelang is a Moravian missionary station in the same province.

Budorodeen, a small military sanitarium, was founded in the Marquis of Dalhousie's Government in 1853, and is between Bunnoo and Dera Ismael Khan.

Abbotabad, named after the distinguished James Abbott, is a military station 22 miles north of Hurri-pore.

Ghizree is a sanitarium newly established by the Bengal Government in Sind, for the Kurrachee brigade of the division of its army occupying that country.

Our next district is Aboo or Mount Aboo, in the territory of Serohee, in Rajapootana, connected with the Arawulli range, and being the only station of the kind in the ranges of Central India, which it is supposed will, on survey, be found to present many suitable sites. It is a new town, and is a post of the agent for the States of Rajapootana, and has a church and many English invalid residents. Here is another foundation of Sir Henry Lawrence, the Aboo Lawrence School, for thirty boys and seventy girls of English soldiers. It may not be forgotten that a special appeal has been made for the endowment of the Lawrence schools, as a memorial of that eminent man, Sir Henry Lawrence, and of the family.

Erinpoora is the military station of Aboo.

* For information on this and other places, the chief authorities used are *Thornton's Gazetteer* and the *New Calcutta Directory*.

We now proceed further south, to the Bombay Presidency. Along the shore of that presidency, the chain of the Western Ghats arises like a wall parallel to the sea, and supports the several table lands of the Dekkan. Thus the inhabitants of Bombay by ascending these hills, which the Great Indian Peninsular Railway will facilitate, obtain a refuge during the violent heats. Poona on that railway has long been a favourite civil and military station, and in its neighbourhood various establishments have been formed.

Dapoorie, four miles distant, is a town with botanical gardens. The season residence of the Governor of Bombay is in this district.

Kerkee is a place two miles from Dapoorie.

Poorundhur is a sanitarium in this division, having an establishment of invalids.

Mattheran is a hill station in the northern division of Bombay, in Tanna collectorate.

Mahabuleswar is a small town on a fertile range of the Western Ghats in the Bombay presidency, but having heavy rains in the monsoons. It was founded by Sir John Malcolm, in 1828. It has a church, library, hotel, bazaar, and invalid garrison. Malcolmpeth is a neighbouring village.

The district of the Neilgherries is a private southern resort for the Madras and Bombay authorities. Ootacamund is its chief town, and is in the Coimbatore district. It was founded in 1822. It has a church, public gardens, and meteorological observatory.

Bishopdown is a place near the town, where there is a cantonment for sick soldiers.

Koonoor is a small station in the Neilgherries, with many English villas, an hotel, and bazaar.

Kotageri is a neighbouring sanitarium.

Kaity is the seat of a German mission in these hills.

One of the best districts for English settlement in India has not been yet named, and that is the valley of Cashmere. By some unfortunate oversight this was assigned to the late Gholab Singh, as a compensation for his political deeds in the Punjab, though any territory of corresponding revenue would have been equally remunerative to him as Cashmere, on which he had no hereditary claim. His successor may be disposed to exchange this territory on some occasion for an equivalent compensation or revenue, if some additional income be held out as an inducement. This should not be lost sight of by the Indian authorities.

The chief results to be deduced from an examination of the hill regions may now be considered. They afford many healthy sites for the residence of English settlers. They afford abundant scope for the enterprise of settlers of large or small capital in the development of the minerals, field produce, and agriculture, and in commercial operations. They present suitable situations for the cantonment of the chief European force now required for India.

By means of railways and tramways they can be connected with the plains, so that the hill garrisons will as effectually command the lower provinces as garrisons in the unhealthy stations. A great economy in the maintenance of the troops will be effected, while the funds so disbursed will contribute to the resources of the hill settlers, and the population of the hills will be strengthened by the soldiery, their families, and dependents. The hill stations afford the healthiest residences, and by means of railways, convenient stations for the governors and chief officers. The Europeans stationed in the plains can keep their families on the hills, and in case of illness can readily resort to healthy climates. The hill towns, becoming the seats of the clergy, schools, engineers, professional men, and skilled mechanics, will afford unprecedented means for extending a purer religion and morality, and a higher civilization among the millions of India.*

The advance of these settlements will open not only new sources of local trade, but promote intercourse with central Asia, and secure our interests in that direction.

The military resources of the soldiery and settlers will secure the whole of the presidencies of India against internal commotion by their distribution of active forces and reserves among the mountain ranges. The growth of English population and improved communication with the hill tribes on the northern frontiers, will present a secure barrier against Russia, Afghanistan, Nepal, and Thibet.

New resources will thus be made available for our home population in this great field of enterprise, whence settlers can profit by the development of agriculture and commerce in the fertile regions of Hindostan.

The thorough establishment of the railway system is a necessity for Lower India, and for the proper operation of the hill settlements. Main lines already authorized by the Indian Government run parallel to the hill regions or approach some of the important settlements, and a provision of cheap branch lines or tramways will make the hill towns effective for military or commercial purposes.

On a superficial view, it seems necessary to place the military stations in the great cities, as Calcutta, Delhi, Agra, Benares, and so forth, with the view of commanding large populations and the main positions. A more careful view will show that the most effective plan, on sound military considerations, is to place the chief force in healthy stations, that is to say, in the hill-towns. We have tried the system of garrisoning the cities of the plains, and it has failed during the late calamities, to afford us the required advantages, for good military reasons. The military force in India is not generally required to keep down the local population, but to be held in reserve, ready to suppress any insurrection, or to act as a field force when required. The central hill stations of India would provide better bases of operations than the cities of the plains, but to make either effectual, the communications must be brought into good condition. It was the want of rapid communication which allowed Delhi, Cawnpore, and Lucknow to maintain their insurrections and hold out against us, and the forces required for their reduction were not obtained from the local garrisons, but from without, from the north-west, from Calcutta, and from the southern presidencies. The plan of placing the forces in Meerut, Cawnpore, and the lower stations is in fact a military mistake, for they can only be kept there at great loss of health and efficiency, the deaths being two to one as compared with the hills, and rendering the assistance of native auxiliaries necessary.

In a political point of view, the garrisons must be placed in the hills, and the railway system extended. The result will be that English settlement will be encouraged

4th of May, said:—"One great deficiency in India was the almost total absence of trustworthy and well-instructed European subordinate agents, which was the first difficulty to be encountered in the prosecution of any enterprise, or the execution of any great works in India. The author proposed that this defect should be remedied by training the children of the European soldiers in India in industrial establishments, to be formed in the Himalayas; and he showed that thousands of English soldiers continually perished in India, without adding to that very element in the settled population of the country which recent events had shown to be so much required. These children who were born in the barracks died in the plains in the ratio of four out of every five. There were at this moment 900 children of soldiers at the station of Dum Dum, near Calcutta, most of whom might be saved and be turned into useful overers, trained agriculturists, and teachers of various branches of skilled industry, if they could be removed to the hills. The author also proposed, with a view to increase the European population, and the settling in India of the lower and middle classes, that the permission for the marriage of soldiers going to India should be extended beyond its present limit of 12 per cent."

* Major-General Tremeneers, in an able paper on "Public Works," read before the Institution of Civil Engineers, on the

without any special outlay taking place, and without the exercise of any special patronage. Thus what we ask is not an enormous expenditure, as alleged, for an experiment in colonization for the benefit of the emigrant classes in England, but only that those measures shall be carried out which are imperative for the good government of India. Seldom is there an opportunity such as this for carrying out a great public measure with facility, requiring careful watching and guidance rather than calling for pecuniary outlay.

The same railways which carry the soldier and his equipments speedily and economically, will carry the settler and the trader cheaply, and enable them to penetrate the country, and it is easy to trace this operation. In the United States or in Canada where the railway system has been applied to a thinner population and a less productive country, the Irish or German emigrant who arrives at New York can travel a thousand miles in a few days, and reach the lakes in the far west for very few pounds. To reach Darjeeling or Simla now he must spend a small fortune, lose time and hazard his health. With the railway he will reach a place of settlement in India as readily as one in Michigan or Canada West.

What we want for India is what has been given to Canada. This conceded, we shall achieve the like results. Prices will rise, labour be enhanced, land increase in value. In India the labourer now earns two shillings a month, and the whole rent and taxation of an acre of land is some eighteen-pence a year. In the Western World, on the other hand, labour is scarce and high-priced, and waste land will sell for as much in many places as the cultivated land of India.

Thus, the grand operation of improved communication will be productive of important economical resources, not only by increasing the real wealth of India, but by creating higher prices.* If these consequences be carefully provided for, the advantages must be great to the metropolitan country and to India. Lands now worth from £1 to £2 per acre, will fetch European prices, and the Government, while receiving a higher revenue, may for the enfranchisement† of the land and the creation

of a freehold tenure, acquire a compensation enormous as is the extent of land dealt with, and the population interested in its cultivation. In speaking of the public rights in the land of India as equivalent to the redemption of the national debts of England and India, and as affording a large fund for public improvements, I have been suspected of extravagance and exaggeration, but whoever carefully watches this subject will see that it is one of importance, and that in this part of the good government of India is to be found a rich and legitimate reward for our labour.

Those who have attempted to exclude the English settler from India have set up the doctrine of India for the Hindoos, and talked of any regard for English interests as an invasion of native rights. The time will soon come when the injustice of this dogma will be seen, and England will not rest satisfied with passive gratification in the welfare of India, but will claim her share in the resources of the empire. The United States, on the acquisition of California, possessed themselves, for federal purposes, of the land revenues, customs, postage duties, and supreme court fees, leaving local charges to be met by local taxation. With those funds part of the public expenses of the United States have been met, and the public debt has been reduced. From India we derive not one farthing, and have been subjected to considerable expense for Indian purposes.

If emigration to India be conducted on a sound basis, then measures should be taken to obtain some compensation from the immigrant for the benefits conferred on him, either by the imposition of a small poll tax, or by the apportionment of the land fund, so that a permanent fund may be created to promote English immigration, and particularly female immigration, and in all cases where an advance is made for such purposes, it should be by way of loan, so that being repaid and reapplied, the fund may produce the greatest results. At present, under the Australian, New Zealand, and Cape system, a young man is taken out by means of the Bounty fund, put in a good position as a labourer, and shortly becomes an independent yeoman,—the colonists lose the benefit of his labour in the labour market, as his passage money is not repaid; and another immigrant is only to be obtained by the further operation of the land sales fund, while many claimants are waiting at home to enjoy the like advantages.*

There are several measures to be kept in view for promoting the objects here pointed out. The first is to carry into effect every legislative improvement requisite to place the English settler in his legitimate position. The consideration of these remedies now occupies Mr. Ewart's Committee. Mr. Ewart has called the attention of the government to another important matter, and that is the provision in any treaty with China for free intercourse with Tibet and the countries on that frontier, where Chinese interference now impedes us. Mr. Campbell tells me, in a letter just received, that he is making a fresh effort to obtain the aid of the Supreme Government of India in opening the trade with Tibet from Darjeeling. Another matter is a watchful policy with regard to the hill states of Nepal and Cashmere. In

or directly, would be easier met; European imports would increase; the execution of productive public works would be facilitated; and benefits of the utmost moment to the people of India, and to this country, would be the sure result."

* I have on many occasions called attention to the principle of making emigration more extensive, by making it reproductive. Of late this principle is making way, but on a limited scale. The Cape Commissioners are sending out persons whose friends in the Colony give security for the repayment of the advance. The best example, however, as yet, of the working of such a system, is that of the Mormon Perpetual Emigration Fund, a sagacious scheme of the leaders of that community for increasing the neophytes at Salt Lake. The working of this scheme is one of the chief inducements to conversion European missions.

* On this subject see the 12th and 13th chapters of my book on "Colonization, Defence, and Railways in our Indian Empire," &c.

† In a very able paper read last night at the Statistical Society, on Indian Finance, Mr. Frederick Hendriks, F.S.S., says:—"Acting upon the precedent of the principle of Mr. Pitt's measure, which rendered the permanent British Land Tax redeemable, a similar course has sometimes been suggested for India. If, however, the carrying out of such a suggestion were restricted in its field of operation distinctly to Bengal alone, or, rather, to those portions of the Bengal presidency where the permanent settlement is an existing institution of the country and cannot be reversed, there do not appear any valid objections to a Land Tax Redemption being effectually carried out. The method should be a cancelment of land tax in exchange for a transfer and cancelment of such an amount of nominal capital in the Indian public debt, as produces an annual dividend precisely equal to the land tax redeemed. A redemption of this kind, not obligatory, but purely permissive, and to be acted upon at the land-holder's own wish, and when his means admitted, would be gradual and self-adjusting; but probably neither the requisite funds, nor the inclination to redeem, would be found wanting in Bengal. But the whole measure of the good it would accomplish is not to be expressed in the mere money result. The middleman, and the inferior servants and agents, who are said to oppress the Bengal ryot, would be more restrained from the power of exercising their love of exaction. And where the state receives, as in Bengal, so large a portion of the rent of the soil, and can disburden itself of the position of chief landlord without any sacrifice, as it would there be enabled to do, it is highly politic thus to increase the number of its freeholding subjects, and, at the same time, to limit their opportunities of oppressing the poorer and hard-working classes. The wealth of the country would be much promoted by the formation of an independent middle class; industrial enterprise would have a better chance of success; a larger revenue from taxation, whether indirectly

their unsettled condition the necessity of interference will arise from time to time, and then judicious arrangements will provide for the welfare of the population and the advancement of our national interests. The English language should be taught and encouraged, and should, in all cases, replace the Persian and other public languages not being the dialect of the local population. A not less useful step is that advocated by Sir C. E. Trevelyan and Professor Newman, of encouraging the Roman type instead of the Hindoo and Arab types for the printing of government proclamations, school books, and gazettes.

In considering for the first time a subject so wide, it is difficult to avoid trespassing on the attention of an audience, and yet impossible to give that fulness of information and of detail requisite to arrive at a conclusive judgment. Enough, however, it is to be hoped, has been done to show that the subject is of importance, and as it is connected with our Indian empire, so neither in this Society, nor among the public at large, will it, when once examined, be considered unworthy of attention.

The Almighty, who, from small beginnings, has raised the English race to the dominion of these islands, and to the occupation of the continent of North America, and has filled it with a nation of our people, has given us the empire of nearly two hundred millions of people in India, and the destinies of a large portion of the human race. This is an inheritance, wonderful in its extent, glorious in its attributes, a means of doing good whereby not individuals, but millions and nations may be blessed, in the promotion of which there is no citizen among us so mean but he may do his share, no intellect so vast but that there shall always be scope for its beneficial exercise, no effort we can make but what will bear fruit, no noble endeavour but will earn its own reward. Let us each in our sphere use these opportunities faithfully, accepting the responsibilities which have thus been offered to us, and while we shall confer lasting happiness on India, the welfare of our race will be hallowed with new hopes and our empire rest on a still nobler foundation.

DISCUSSION.

The CHAIRMAN said, only a brief time remained in which to discuss this highly-important and interesting subject. Seeing present Mr. Theobald, whose name was so materially associated with the question of India, he should be happy to hear that gentleman's observations.

Mr. THEOBALD felt complimented by the invitation of the Chairman, although, quite unexpectedly called upon to take part in the discussion. He had listened to Mr. Hyde Clarke's paper with the greatest pleasure, and the views that gentleman had put forth fully accorded not only with his own opinions but, he believed, with those of every British settler in India. They certainly wanted those improvements, social, political, and judicial, which had been so ably pointed out by Mr. Hyde Clarke, as it could not be denied that all classes in India suffered from the defects in all those points which had been adverted to. With regard to the climate it had been truly observed that the Presidency of Bengal was one of the healthiest in India. They were in the habit of hearing the claims of the United States of America advanced in a sanitary point of view, as favourable to European constitutions, but he did not believe that the physical condition of the population of the United States was better than that of the residents in Bengal. It was very desirable that their fellow countrymen should be disabused of the notions so generally prevalent with regard to the climate of India. It had been placed beyond all question that the hill countries which formed the leading subject of the paper were, in an eminent degree, adapted for European settlers, as the temperature there was much lower than in the plains. At the same time, it must be ad-

adapted to Europeans whose occupation was that of agricultural labour, nor was it necessary that Europeans should be so employed. There was native labour in great plenty, which could be procured at a much cheaper rate than European labour. What was most wanted, both in the hill stations and in the plains, was European intelligence, European skill, European civilisation, and he might add, above all, European capital and enterprise, for although many of the natives were very wealthy, they were not persons of enterprise, and did not introduce improvements. They accepted the country, the climate, and the population as they found them; but what was wanted in India was—institutions of a character more in accordance with those which, as British subjects, we were accustomed to associate with the idea of a well-regulated order of things, both social and political. Mr. Hyde Clarke had recommended the establishment of municipal institutions, and the practice of self-government which existed in England, but he (Mr. Theobald) thought that the idea of such institutions was beyond the reach of the experience and capacity of the Indian Government. In the great Presidency cities, such as Calcutta, with a large European population, there were abundant opportunities for municipal management. It was of the first importance that we should be on the best terms with the native population, and he saw no reason why we should not in such cities, and even in the towns of the hill stations, have municipal management. The want of it was greatly felt in Calcutta. He recollected the time when something approaching to that desirable state of things was established in that city; but the government, so unused to municipal institutions, began with that which, even in this country we had not yet attained to, viz., universal suffrage. In the election of municipal commissioners there was universal suffrage; and it was hardly to be supposed that a government constituted as was that of India, would be satisfied with the results of universal suffrage. The consequence was, that those commissioners who had been chosen by universal suffrage were reduced, in the first instance, to half the number originally appointed, and then were made permanent commissioners. He thought a better organization of the Supreme Government was required. It was for the Parliament of this country to say what the form of government in India should be; but, in any case, it should be a system of government which accorded with the feelings of the European population as respected the general administration of affairs. The effect of railways in India would be appreciated by everyone. With regard to the question of land tenure, in every part of India there was a different system; in Bengal proper, which was as large as the entire empire of France, with a population of about 40,000,000, the system of land tenure was, upon the whole, favourable to European settlement; the effect of which was shown by the fact, that lower Bengal was the only district in which there was any considerable number of European settlers. It was only by a system of tenure in perpetuity that increased European settlement, and the employment of European capital and enterprise in India could be effectually brought about. In the hill-stations, and in Madras and Bombay, the system of government was altogether different. In the province of Oude, which had lately fallen under British dominion, the same system of absolute proprietorship in the soil by the government, as prevailed in Bombay and Madras, had been established, and the rents or assessments were annually collected by an army of police. They would readily imagine that such a system was practically prohibitive of the investment of capital in the soil. What was particularly essential in India, was a proper revenue system, and, above all, due protection to person and property, as well as an administration of justice founded upon equal laws for all classes. In no part

of India did there at present exist a proper administration of justice. The East India Company might be regarded rather as the agent of the Mahomedan government, than as exercising powers in accordance with its own views of what was just and expedient, and the changes that had taken place since India had fallen under British rule, were not such as were to be looked for at the hands of enlightened rulers. An administration of justice, based upon British principles, was urgently required, and where natives were employed as administrators, they ought to be persons properly instructed for the purpose. He was afraid this could not be accomplished without giving the natives a great deal of that sort of education which had not hitherto been given them. They now claimed an excessive share in the administration of all the functions of government, but he (Mr. Theobald) maintained that in order to secure a due administration of justice, they must look upon all classes as holding equal social rights, whether Hindoo, Mahomedan, American, or European—all should be equal in the eye of the law, without distinction of race or creed. That was the British idea of the administration of justice. But in India there was the influence of caste, and the Mahomedan claimed for himself privileges which he was not willing to accord to the Hindoo—in fact, the Hindoo was hated by the Mahomedan, and it was a great mistake to suppose that those different races would exercise towards each other the same impartiality that we in this country should be disposed to show towards them. The East India Company had been opposed to European settlement in India, and to all kinds of settlement by which a social and political position could be acquired. At one period it was the wish of Sir John Malcolm to establish a colony of East Indians who, it was to be remarked, were a race almost as distinct from the native population as the natives themselves. Our Indian population, wishing to provide a vent for their surplus population, entertained the idea of founding a colony of East Indians, but in this they were frustrated by the authorities of the East India Company, as it was opposed to their policy to allow of colonization. What was wanted was—a Government actuated by liberal principles to do impartial justice, both as regarded Europeans and the native population. He believed the few points he had adverted to had formed the great bar to European settlement in India.

Mr. P. L. SIMMONDS said that it had been well remarked that it was British skill, energy, and capital, which had already accomplished so much for India. While congratulating ourselves, however, on the successful results of our exertions in this respect, as evidenced in the largely increased trade and commerce of India as compared with twenty or thirty years ago, there yet remained much to be done, and such a paper as the one they had just listened to was eminently calculated to promote that end by calling increased attention in England to the subject of India and its resources. Not but what India had occupied a very large share of public attention during the past year, but this was chiefly concentrated on its social, political, and disturbed condition, and not specially on its agricultural resources, trade, and commerce. The evidences of British skill and capital were brought prominently before them that evening, not only in the excellent paper of Mr. Clarke, but in the photographs taken of the progress of great public works, the maps and plans of railway extension and canalization, improved river navigation, models of vessels suited to those rivers, and the indigenous products, tea, fibres, &c., which were doubtless familiar to many. Hill colonization by sanatoria, the wide extension of the telegraph, the diffusion of the press, of schools, churches, and missionary enterprise were other evidences which had been adverted to by Mr. Clarke. Glancing, however, over that more especial field with which he (Mr. Simmonds) was most conversant,—the commercial products of India—a field of inquiry, in which, since the death of Dr. Royle

(who had done so much to develop the resources of India), he was left almost alone, what did they find? He held in his hand a comparison which he had drawn up of the present Indian exports with those of 20 or 30 years ago. He would not take up the time of the members by quoting it at length, although it proved some very important facts. But this at least he might say, that, large as had been the increased shipments from Indian ports, and greatly as the export trade had been stimulated, the resources of India had not been developed proportionately with those of Mauritius, Ceylon, and Penang, where British settlers and British capital had free play, and full scope for the exercise of their enterprise and skill. It was lamentable to glance over the vast expanse of territory held under British rule in Asia, and to know that the English population was limited to a few thousands. Some of the causes which had led to the obstruction to settlements in India, which had retarded many important industrial operations, would, he hoped, be shortly removed. Then we might expect to see an increased stimulus given to the cultivation and export of many of those staple products which were so readily and cheaply obtained in India, and were so essential and so important to the trades and manufactures of Great Britain. When we saw that from small beginnings the manufacture of tea was making such favourable progress in various districts of India, and that, besides the local consumption, about three-quarters of a million of pounds were now shipped to England, this manufacture must necessarily extend. But at present tea was only a minor product of the hills. The staples of the plains had risen already to great importance, and would, when order and confidence were thoroughly restored, when internal communication was improved, when capital and British skill to direct and encourage were more common, increase still more. Even now India supplied us with one million and a half cwts. of cotton, with three and a half million cwts. of rice (and the cultivation in Arracan was largely on the increase), with one and a quarter million cwts. of sugar, spices, and condiments. Take again jute, hemp, corn, and other fibres, and these reached an aggregate of about 800,000 cwts.; oils to the extent of 73,000 cwt. came in annually from India; gums, and resins, and vegetable extracts reached 5,000 to 6,000 tons. Then there were wax and silk, and the important products of the forests, besides the dye woods and dye stuffs, such as red wood, safflower, indigo, as well as the drugs and medicinal substances, borax and saltpetre. Of that important ship-building wood teak, we imported, in 1856, 16,500 loads. Coffee was now grown in Chota-nagpore, Malabar, Travancore, and Mysore, and about 4½ million pounds were now shipped. The average production of indigo in Jessore and other districts of Lower Bengal, was now over 100,000 maunds (of 74 lbs.), our imports from thence exceeding 71,000 cwts. A little indigo was grown in Scinde, and the culture of the plant could be extended to many other localities. Excellent tobacco was grown at Masulipatam, Rajmundry, Coimbatore, &c., although not in sufficient quantity to export. The production of opium in Patna and Benares, and in Malwa, had doubled within the last ten years. These were some of the indications of British enterprise and British industry which could not be overlooked. But the suggestions of Mr. Clarke would carry forward the work on a more rapid scale. The connection of healthy hill towns with the cities of the plains and the non-tropical districts, would necessarily draw residents to India, and give a guiding influence not only to tropical cultivation, but to the extension of our trade with Tartary and Thibet, &c., through Bhotan, Nepal, Cashmere, Ladak, &c., by the various mountain passes. Of this interior trade comparatively little was at present known, and yet, various data he had consulted, exclusive of Tartary it not be set down at less than a million and a half at

While we were largely indebted in our trading operations for raw materials to India, a mutual exchange was being carried on. Maize, the potato, the capsicum, and many Western fruits had been introduced into India. The mahogany, logwood, pimento, and other important trees of the new world, were now spread over the whole country, while we had drawn from the Himalayas the valuable *Pinus deodara* and other trees and plants. The vine, the apricot, the raspberry, the strawberry, the olive, the caraway-seed, and other plants grew in wild luxuriance all over the Himalayas. Vines flourished on spots almost inaccessible; and the caraway seed, whose delicious fragrance was so highly prized in Asia, grew in places where, six months in the year, the snow lay deep, about 15,000 feet above the level of the sea. The late Dr. Royle, in his "Productive Resources of India," published twenty years ago, after enumerating the varied vegetable productions of that country, referred specially to the mountains, and remarked that "though their bases are covered with a tropical and unhealthy jungle, they abound in valuable woods, have at certain elevations a delightful climate, and productions analogous to European countries. There we may soon hope to see the tea plant a thriving culture, and the hemp turned to useful account. Also, though the cold and bleak tops of these mountains, and the plains on their northern face, appear barren and unproductive, their lakes abound with borax, and their valleys with vines; and we have in addition spikenard and rhubarb from the vegetable, with musk from the animal kingdom." Since these lines were penned, very much had been done, but much more remained yet to be accomplished. Indeed, to comprehend the diversities of so wide a field, to evolve its various natural resources and to display its manifold capabilities, was a task of no ordinary magnitude, but the benefits which might be insured were more than commensurate to the difficulties to be overcome, and if only ordinary precaution were taken in suiting our measures to the objects we had in view, every fresh step would afford an advanced position from which to make further progress, so as to afford facilities to the government and benefits to the people.

Mr. HENDERSON said that Mr. Hyde Clarke had guarded himself from the imputation of advocating the colonisation of India in the same sense as would be understood in reference to any of our other colonies, and had had recourse to the phrase "English settlement," for the purpose of avoiding the misapprehension occasioned by the first-named term. The reasons given by Mr. Clarke for this change of expression did not appear to be sufficiently precise. Colonisation in India, whether on the hill regions or elsewhere, must be understood in a different sense from what was usually implied. What was wanted for Canada, Australia, &c., was simply labour and capital; but in India it was not labour, but skill and integrity that were required. India already possessed more manual labourers, in most localities, than she was able to give continuous or profitable employment to. The population of India was sufficiently great to turn to account the whole productive resources of that country. What she required was brain, not muscle. She needed the seeing eye and the guiding hand—not the mere brute labour, which, after all, could be supplied by a colony of chained convicts. India was the field of colonisation for the educated middle classes of England, not for the hewers of wood and drawers of water. To lose sight of this distinction was to mistake the whole question. The position of Englishmen in India must of necessity be that of a governing class; *sahibs* (or masters), not labourers. India was no field for English labour; the climate and the superabundance of the population precluded its introduction into that country. The thing then to be considered was, how were Englishmen of the educated class to be kept in health in India, without having recourse to the expensive system of furlough to England. Mr. Clarke saw in the so-

lution of this problem a means of materially strengthening our hold on the Indian Empire, and very justly considered that whatever tended to such a purpose was well worthy of the attention of the people of England. To understand the difficulties in the way of establishing English settlements in India, it would be necessary to recur to the condition of the Indian Government some forty years ago, when he (Mr. Henderson) had first become acquainted with it. Previous to the year 1813, India had been sealed to all Englishmen not in the service of the East India Company. To obtain a licence to reside as a free merchant in the country, or even to enter any of her seaports as a free mariner, required as much influence and diplomacy as were now necessary to obtain a writership or a cadetship. At this time, almost the only commercial houses in India were either directly or indirectly under the management of the Company's servants, who took good care that interlopers should have no chance of competing with them. This was the era of the famous "pagoda tree," when fortunes were made in as many months as would now require years. In 1833, when the East India Company relinquished their monopoly of the China tea trade, the Indian Government also abandoned its mercantile character and the operations which they had commenced for the cultivation of tea in their own province of Upper Assam. The preliminary expenses of European supervision were undertaken by the Bengal Government for the first three years, when, on the formation of the Assam Company, the gardens and part of the establishment were transferred to it by the Bengal Government, the reports of their officers inducing the belief that a crop of two million pounds of tea would be obtained in seven years. The offer was accepted, the merchants of London and Calcutta establishing the Assam Company, with a capital of £500,000, of which £200,000 was speedily paid up, and invested in cleaning the land, granted free of rent for 20 years, and arrangements were made for the transmission of labourers from the lower provinces, two ships having been despatched from Singapore and Penang with 460 Chinese labourers, for the cultivation and manufacture of the tea. They also provided the Assam steamer, a model of which was on the table, and the *Naga* tow boat was constructed in Calcutta and despatched to Assam in 1840, carrying with her a saw mill. The difficulty, however, of procuring a steady supply of labour was very great, so that not one tithe of the crop anticipated was realised. A great loss was thus sustained, principally, however, from the scarcity of intelligent and energetic superintendents, and from the great mortality arising from the malaria engendered by the newly cleared forest. Had there existed at that time English settlements on the hill regions, or had adequate encouragement been given by government for emigration of the educated classes from England, there would doubtless have been little difficulty in procuring the necessary number of trustworthy superintendents. Mr. Clarke had very properly subordinated this idea of English settlements to that of improved means of communication throughout India. The railways now in progress of construction would no doubt, in the course of a few years, enable the different sanitaria and hill stations to be within easy access of the great centres of commerce and military operations; but, at present, the completion of these lines was delayed from want of adequate means for conveying the railway stores and material. The means hitherto available for this purpose were the steamers and other vessels plying on the great rivers, but the exigencies of Government, during the late crisis, had absorbed nearly the whole available means of water transport, and the railway operations had been seriously retarded. With the view of overcoming this difficulty, as well as providing for the means of communication to the eastward and southward of the Ganges, he (Mr. Henderson) had devised a system of *steam tug* and tow boats for general purposes, capable of being

managed by native crews, with or without steam power—models of which were on the table.

The CHAIRMAN proposed a vote of thanks to Mr. Hyde Clarke for his valuable and highly interesting paper, and expressed his regret that the time did not allow them to discuss this subject in a way that its importance deserved.

The Paper was illustrated by various maps, views, and photographs kindly lent by the East Indian Railway Company, the Madras Railway Company, the Oude Railway Company, Mr. Ewart, M.P., Mr. Wyld, M.P., Messrs. J. and C. Walker, Messrs. Kell, and Messrs. Maclure, Macdonald, and Macgregor. On the table were specimens of tea, contributed by the Assam Tea Company, and models of boats designed and lent by Mr. A. Henderson.

The Secretary announced that on Wednesday evening next, the 26th inst, a Paper by Mr. M. Digby Wyatt, "On the Influence Exercised on Ceramic Manufactures by the late Mr. Herbert Minton," would be read.

The following letter has been received by the Secretary:—

SIR,—Had other engagements permitted, I should certainly have accepted the invitation to take part in the discussion upon Mr. Hyde Clarke's paper.

As an auditor of Indian railways, I know how important an element of judgment is the financial and economical view of our Indian policy, and I venture to contribute a few considerations from that point of view.

So long as India could be regarded chiefly as a market for the sale of our wares, or for the supply of our wants, it was not within the power of the privileged corporation which Great Britain fostered, either to compromise the national honour or to commit the national resources. Now, however, that territorial rights and responsibilities have devolved upon us, and supreme government has come to be exercised on behalf of the Crown, we can no longer deal with our fellow subjects in a mere trading spirit; and if we were even warranted to consult our immediate convenience and abandon millions of our fellow men to the chaos which our rule alone prevents, we should nevertheless not dare so to debase Great Britain in the scale of nations, as to flee from that conspicuous post in the van of civilization.

How best to maintain India in peace is the question of the day. Does any observant man doubt that the rebellion might have been averted, even with the handful of European troops available at its outbreak, could railway enterprise, fostered in due season, have then afforded moderate facilities for the transit, distribution, or concentration of forces?

What an appalling picture were a balance-sheet, showing, on one side, the cost of the rebellion in blood, treasure, prestige, and progress; on the other side, the contingent responsibility in respect of a few hundred thousand pounds per annum of guaranteed interest upon railway capital during construction.

The debit side of such a balance-sheet will remain beyond the power of mere figures to express; the other side has been thus intelligently computed by the City Editor of the *Times*, a competent appraiser.

"The responsibility is simply a guarantee upon railways, and this, according to present experience, promises ultimately to be merely nominal, since the lines, while they will enormously increase the tax-paying power of the people, are likely, at the same time, to yield upon completion more than the rate of interest to which the government stand pledged."

It was a bolder policy which happily determined the

construction of telegraphs in India, and we have it on no less authority than that of Colonel Sykes, ex-Chairman of the East India Company, that the telegraph has been the salvation of our Indian empire, while it has also proved a commercial success.

The cry is still—more men from England! and we are told that 50,000 men are placed in India at a cost of £100 each, i.e., five millions of pounds sterling! How instructive is the problem suggested thereby. Since these men must be relieved or replaced at short intervals, because of the ravages of climate and concomitant evils, what is the capital sum which, at market rates of interest, is equivalent to the recurring cost of these periodical reliefs or replacements? And what fragment of that capital sum would suffice to open up the proposed sanitary retreat in Northern Bengal, within a few hours' rail of Calcutta, where, we are told, European troops might luxuriate in a genial atmosphere, and be maintained, within call, for effective service in all emergencies; if, indeed, all emergencies need be apprehended when the native mind shall become conscious of such resources in reserve.

If Indian enterprise, as an investment, did not happen to be associated in the public mind with the guarantee of a minimum dividend of 5 per cent. (not advanced out of capital as in other analogous cases, but contributed direct from the public treasury), there would be less disposition to weigh the security offered by the guaranteeing party, i.e. the solvency of the Government of India prospectively.

The present market price of Indian Railway Stock, contrasted with what it used to be when money was less abundant, before the rebellion, seems to present some anomalies.

1. Then, East India Railway Stock fetched £130 per cent.; the East India House, in Leadenhall-street, being the ostensible government, one which in popular estimation, might have been left in the lurch, and perhaps ejected from India; whereas now, the corporation is already virtually superseded by the Imperial Government, and the honour and resources of the whole empire are in the face of the world committed to the maintenance of our supremacy in India.

2. Then the line opened was not yet earning the outgoings in respect of it; whereas now, its rapidly developing traffic already yields 7 or 8 per cent. net profit.

3. Then, a constituency holding until 1874 a stake in India, represented by £6,000,000, exercised a certain influence to the exclusion of all others; whereas now, the railway proprietary, interested possibly for 99 years, to the extent of some £30,000, may rest assured that if any constituency shall hereafter have a voice in Indian affairs, to them will be recorded a due preponderance for the protection of their proper interests.

4. Then, the Imperial Government was a mere creditor in respect of such advances as occasion might require, whereas, hereafter, still larger advances from the Government, in one capacity to itself, under some other name or form, must unavoidably take rank in subordination to claims of simple creditors, especially guaranteed ones.

This fourth contrast, however, moots the hair-splitting question of the extent of Imperial responsibility, for the pecuniary engagements of the Indian executive, which it (the Imperial Government) has controlled, and is about to supersede. Deliberate opinions, from those of Peel in 1842, down to those of Gladstone, Disraeli, Baring, and other authorities in 1858, might be more usefully cited here if the question seriously affected Indian railway securities. What boots it, however, to discuss, whether a bill accepted by the Indian Government does or does not convey a claim "in need" upon the Imperial treasury, so long as 7 or 8 per cent. is available already, and the Imperial treasury is becoming more and more committed to the protection of the railway, a dividend paying highway, to an extent far in excess of the minimum of interest guaranteed.

Occasionally consulted upon the relative merits of investments, as such, my attention has been naturally directed to the swollen currents of floating capital, which continue to congest the ordinary channels, and prevent a healthy rise in the rate of interest. 'This is a common sequence of every monetary crisis, and unless a due appreciation be induced of legitimate British enterprise, we shall soon be drawn into a vortex of wild speculation, with its inflated promises and demoralizing results. Nay, even with reference to foreign governments, which find it expedient to pay dividends through good or through evil report, may we not demand whether the same capital, which, if buried in Russia or like soils, might, as in the fable, spring up armed men, must not, if employed in developing the magnificent resources of our own Indian empire, conduce to results at once conciliatory and civilizing, profitable and reproductive of occasions for profit, as well as conversive of what were else a drain upon our resources, into a noble element of the national strength.

I am, &c.,

J. A. FRANKLIN.

9, Warrford-court, 17th May, 1858.

SOUTH KENSINGTON MUSEUM.

During the week ending 16th May, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,098; on Monday and Tuesday (free evenings), 4,262. On the three Students' days (admission to the public 6d.), 924; one Students' evening, Wednesday, 186. Total, 9,420.

Home Correspondence.

THE SEWAGE QUESTION.

SIR,—As an exhibitor of new apparatus at the Society of Arts, to manage and utilise sewage on a new principle, I was anxious, at the last meeting of the Society, to draw attention to the model on the table, and several drawings illustrating its principles and mode of operation. I was, however, so satisfied with the turn the discussion was taking—tending to show that the whole system at present rests upon wrong principles—that I contentedly waited until it was too late to enter upon anything like a clear explanation.

In opening the discussion, Lord Ebury remarked upon the unsettled and unsatisfactory state in which the whole question was still left, after the last as well as all the reports and investigations on the subject, noticing particularly the term employed by Mr. Baker, the reader of the paper, to the effect that we were still "hammering at" a plan. Most of the succeeding speakers took much the same view, complaining that there was nothing to "go upon" in the new Report of the Royal Commission, and that the whole question required to be discussed and examined again *ab initio*, in which I fully agree.

Another observation made by his lordship touches, I think, upon the very point upon which the re-discussion should take place.

In explaining the reasons why the nuisances so much complained of had not been more rapidly and successfully abated, he observed, that until even a recent period the duties of the authorities were strictly "to prevent all sewage matter from getting into the sewers," and not to consider how best to send it through them. Now it is to this point, I think, we must return at last; in fact, to the consideration of whether this great change was a wise and beneficial alteration or not. *Nulla vestigia retrosum*

may be a good motto in heraldry, but in more practical matters it is a very dangerous one; in all cases when a false move has been made, backed out of, the better, according to

Now, I am perfectly convinced, and have been so for some time, that a gross error was committed in that change. With all its *desagrédios*, I think it was at least a safer plan than the present one, which indeed seems to be attended with quite as much nuisance, and is certainly more complained of, and that not without reason. If, however, it can be shown that all the inconvenience and nuisance attending the removal of house-refuse can be easily and completely avoided, and even the trouble of it reduced to a mere nothing, the objections to a return to the old plan ought, in reason, to be considered as removed.

In a paper read before the British Association last year (but which there was no time to discuss), I endeavoured to prove that position, and I have since re-examined the whole subject very carefully. That paper is now published,* and all the apparatus necessary and proved to be effectual and easy of application for the purpose, may now be seen at the Society's Exhibition.† Many details of the plan no doubt remain yet to be filled up, but I believe the great principles of it have been made out, and indeed it has been proved to act satisfactorily in practice.

I am, &c.,

J. LLOYD, M.D.

Anglesea, May 17th, 1858.

MR. SANDERSON'S PAPER ON IRON.

SIR,—In reading my paper perhaps some misapprehension may arise as respects the reduction of the metalloids and the discharge of the phosphoric acid; the rationale is this—sulphate of iron being used as the flux, the oxygen of the sulphuric acid, and probably that of the protoxide of iron also, or a part of it, unites with the carbon in the pig iron, and with the metalloids, oxidising the latter into their earths, the sulphur into sulphurous acid, and the phosphates into phosphoric acid, the carbon becomes carbonic oxide or carbonic acid, most probably both, the sulphurous acid goes off in fumes, and the earths due to the oxidized metalloids pass with the phosphoric acid into the cinder. The phosphoric acid has by accident been described as volatile, at least the paper may be so understood; this, however, it is not.

I am, &c.,

CHARLES SANDERSON.

Sheffield, May 18, 1858.

Proceedings of Institutions.

HALIFAX.—The last report of the Mechanics' Institution, read at the annual meeting, at which John Cramley, Esq., presided, states that the number of members and subscribers amounts in the aggregate to 1,399, showing a large increase upon that of last year. The number of volumes added to the library, during the year has been 368, the total number being 4,285. The issues during the same period have been, of volumes, 15,275; periodicals, 3,230—total, 18,505, being an increase over the previous year of 5,525. Lectures of a superior character had been provided, but which, however, had not been very well attended. The lectures of John Abbott, Esq.; H. Phillips, Esq.; John Stores Smith, Esq.; the Rev. E. Mellor, M.A.; J. D. Hutchinson, Esq.; and the Rev. R. L. Carpenter, B.A., were all gratuitous, and to those gentlemen the best thanks of the Institution were due. The additional class accommodation provided had been fully occupied by fresh applicants for admission to the classes, on removal to the new premises. In order to perfect their organisation much time had been spent, and a large expenditure incurred, each class-room having been supplied with the appropriate school requisites. The benefit arising to the pupils by this outlay was already

* Engineer Office, No. 163, Strand.

† See No. 229 in the Catalogue.

perceptible, and the classes were now in an efficient condition. In order to sustain this, a considerable portion of the income of the Institution must be spent in this department. The average attendance of the classes on each evening for the year is 189. The Rev. Mr. Carpenter, Mr. Lewthwaite, and Mr. H. Foster, are gratuitous teachers. The number on the books of the female branch is, adults, 50; juveniles, 73—total, 123. These classes are taught gratuitously by Mrs. Carpenter, the Misses Stansfeld, and Miss Birtwhistle. The average attendance of the juveniles is 35, and the aggregate attendance of adults and juveniles has frequently exceeded 80. The success of the penny savings bank had outstripped the most sanguine expectations of the directors; the amount of deposits paid in during the last six months being £1,643 10s. 6½d., and the amount of interest allowed, £28 16s. 9d. The present number of pass-books out is 4,167, and there are no fewer than 3,100 open accounts. Notwithstanding the munificent donations made to the Building Fund, there is still a considerable debt remaining upon the Institution, but the directors observe that seldom has there been such a cordial union of all parties in the community to recognise the claims of a public Institution; and seeing that, to such a large extent, public sympathy has been enlisted, they do not despair of the entire removal of the debt at no very distant period.

MEETINGS FOR THE ENSUING WEEK.

- Mon.**.....Geographical, 1. Anniversary.
Linsman, 1. Anniversary.
- Tues.**.....Royal Inst., 3. Mr. J. P. Lacaille, "On the History of Italy during the Middle Ages."
Meteorological, 7. Anniversary.
Med. and Chirurg., 8½.
Civil Engineers, 9. President's Conversations.
- Wed.**.....Geological, 5. Mr. Harkness, "On Jostlings and Dolomites near Cork." Mr. Prestwich, "On the Westward Extension of the Raised Beach of Brighton." Dr. Bigsby, "On the Palaeontology of the Straits of New York."
Society of Arts, 8. Mr. M. Digby Wyatt, "On the Influence exercised on Ceramic Manufactures by the late Mr. Herbert Milton."
Archæological, 8½.
- Thurs.**.....Numismatic, 7.
- Fri.**.....United Service Inst., 2. Lieut.-Col. E. Wilford, "On the Qualifications necessary for an Infantry Soldier efficiently to use highly improved modern Fire Arms."
Royal Inst., 4½. Dr. E. Frankland, "On the Production of Organic Bodies without the Agency of Vitality."
Royal Inst., 5. Dr. Eankester, "On the Vegetable Kingdom in its relations to the life of man."
Medical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Part No.**
- Delivered on 7th May, 1858.*
16. **Bills**—Bishops' Trusts substitution.
17. — Ecclesiastical Corporations Leasing.
Statistical Abstract for the United Kingdom, from 1843 to 1857.
Delivered on 8th and 10th May, 1858.
161. Civil Contingencies—Account and Estimate.
162. Oxford University—Copies of Four Ordinances.
163. Oxford University (Scholarships of Lord Craven's Foundation)—Copy of an Ordinance.
164. 15th Mail Contract Vessels—Return.
165. Poor Relief (Ireland)—Return.
166. Education—Return.
167. Navy—Return.
168. Barracks (Metropolis)—Return.
169. Probate Duty—Return.
170. East India (Onde)—Copies of Letters and Proclamations.
171. Victoria Station and Pimlico Railway Bill—Return.
172. Public Works (Ireland)—Account.
173. Straits of Malacca—Copies of Correspondence.
174. Education—Paper.
175. **Bills**—Ecclesiastical Residences (Ireland).
176. — Oxford and Cambridge Universities, &c., Estates.
Savage of Toyns—Preliminary Report of the Commissioners.
Delivered on 11th May, 1858.
177. **Bill**—Sale and Transfer of Land (Ireland).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, May 14, 1858.]

- Dated 8th March, 1858.*
466. B. B. Stoney, Dublin—Imp. in buoys, floating beacons, and other similar floating b dies.
- Dated 11th March, 1858.*
442. W. S. Clark, Atlas Works, Upper Park-place, Dorset-square—Imp. in metallic canisters for holding gunpowder and other articles of a similar nature. (A com.)
- Dated 24th March, 1858.*
424. A. L. Thirlion, Aliche-en-Betail, Belgium—An improved method of transforming circular movements.
- Dated 15th April, 1858.*
416. F. S. Thomas, Junction-street, Kenish-town—An improved mode of propelling carriages upon railways.
- Dated 20th April, 1858.*
463. W. S. Clark, Atlas Works, Upper Park-place, Dorset-square—An improved cultivator tooth for agricultural purposes. (A com.)
464. E. Peacock, New Holland, Lincolnshire—Imp. in apparatus for preventing smoke in furnaces, and in effecting a more perfect combustion of fuel.
- Dated 22nd April, 1858.*
461. T. Hutchison, Paisley—Imp. in shawls.
465. G. Smith, Morriston, near Swansea, Glamorganshire—Imp. in the manufacture of zinc. (A com.)
467. P. Maugey, Paris—Imp. in diaphragms for optical instruments. (Partly a com.)
468. H. A. de Saegher, Brussels—A composition proper to prevent the incrustation of steam boilers.
469. W. Beck, New York—Improved machinery for weaving fringes and other fabrics. (A com.)
461. T. Harrington, Dover—Improved mode of ventilating the hold and other parts of ships.
462. J. B. Paddon, Gray's Inn-road—An imp. in gas regulators.
463. J. Stocks, Berry Brow, and Charles Kaye, Leekwood, Yorkshire—Imp. in apparatuses for coupling and uncoupling wagons and carriages on railways.
464. T. Donkin, Barmadsey—Imp. in apparatus employed in the manufacture of paper, applicable also to controlling the motion of travelling webs and fabrics. (A com.)
- Dated 23rd April, 1858.*
465. T. Greenhields, 11, Little Titchfield-street—Imp. in purifying gas produced from coal, and obtaining ammoniacal and other alkaline salts.
467. O. Atkinson, Sheffield—A certain imp. in Venetian blinds.
468. H. J. Sillem, Liverpool—Imp. in the machinery for the manufacture of sugar.
469. J. P. Pirson, New York, U.S.—Imp. in the condensers of steam engines.
490. W. Foster, Black Dike Mills, near Bradford—Imp. in multi-tubular and other boilers for the prevention of smoke and economising fuel.
491. A. Jenkin, Curriek Mines, Dublin—Imp. in furnaces for the reduction and calcination of lead, tin, and copper ores.
492. J. O. York, Paris—Imp. in obtaining power when bi-sulphuret of carbon is used. (A com.)
493. C. Lunglej, Deptford Green Dockyard—Imp. in the construction of portable ships and boats, and their appurtenances.
- Dated 24th April, 1858.*
495. J. Maitre, Thieffrain (Aube), France—Proper apparatus for washing iron minerals.
497. R. Bodmer, 2, Thavies-inn, Holborn—An improved apparatus for removing sand and similar loose material from docks, rivers, and waterways. (A com.)
498. F. Lillywhite and J. Widen, Coventry-street—An improved apparatus for projecting cricket balls, or other similar articles.
499. W. A. Clark, Bethany, U.S.—Imp. in expansive bits.
4910. J. Horton, Ashburton—An improved construction of horse-hoe.
4911. J. Lawson, Leeds—Imp. in machinery used in spinning flax and other fibrous substances. (Partly a com.)
- Dated 26th April, 1858.*
4912. L. Newton, Oldham—Imp. in cop tubes used in spinning machinery.
4913. B. Burieligh and P. L. Danchell, Great George street, Westminster—Improvements in filters.
4914. J. M. Fisher, Taunton—Imp. in chimney tops or cowls.
4915. J. Braidwood, Glasgow—Imp. in steam boilers and furnaces.
4916. J. Westbury, Huddersfield—Improved apparatus for lubricating pistons.
4917. W. Jones, Pendleton, Lancashire—Improved machinery for ringing bells.
4920. J. Seaman, Britannia Iron Works, Bedford—Imp. in machinery or apparatus for effecting the working or cultivation of land, and in the means of driving the same.
4921. W. Foster, Lower Tower-street, Birmingham—An improved vent-lap.
4922. E. E. Lee, Birmingham—Certain improved modes of applying vitrifiable materials for the ornamentation of metal, buttons, clasps, and other articles of dress, and which said improvements are also applicable to the ornamenting of gilt-jewellery, book-clasps, and mounts, also parts of lampstands, chandeliers, and other such like articles made in moulded, or formed in any other way.

923. T. Dobson, Birmingham—Imp. in machinery or apparatus for forging iron.
924. W. E. Newton, 66, Chancery-lane—Imp. in covering roofs and other parts of buildings with slate or other materials. (A com.)

Dated 21st April, 1858.

925. E. Hunt and H. D. Pochin, Salford—Imp. in the treatment and application of resins and resinous substances.
926. E. White, Bath—Imp. in facilitating reference by means of indexes.
927. K. Simons, Birmingham—Imp. in cornices and cornice poles for window and other curtains.
928. C. F. Vasserot, 45, Essex-street, Strand—Imp. in the arrangement and construction of blast-engines, pneumatic machines, and pumping engines generally. (A com.)
929. J. Fraser, Blue Vale Chemical Works, Gallowgate, Glasgow—Imp. in the manufacture of nitrate of potash.
931. G. R. Tovell, Mistle, Essex—Imp. in the construction of ships and other vessels.
933. M. Moss, 15, Marlborough-place, Old Kent-road—Imp. in ladies' petticoats.
934. J. Hulett, Aldersgate-street—An imp. in shirt collars.
935. M. Sautter, Paris—A new and useful imp. in diving bells. (A com.)
936. W. Keiller, Dundee, N.B.—Imp. in apparatus for cutting, reducing, or dividing vegetable, animal, and other substances.
937. W. E. Newton, 66, Chancery-lane—Imp. in machinery for splitting leather or skins. (A com.)
939. J. F. M. Charpentier, 39, Southam-row, Russell-square—A fire escape.

Dated 28th April, 1858.

940. M. A. F. Mennon, 39, Rue de l'Ecliquier, Paris—An improved apparatus for the condensation of smoke. (A com.)
941. M. A. F. Mennon, 39, Rue de l'Ecliquier, Paris—An improved sponaceous compound. (A com.)
942. M. A. F. Mennon, 39, Rue de l'Ecliquier, Paris—An improved process for combining silk with other textile substances. (A com.)
943. B. Martin and C. J. Light, Great George-street, Westminster—Imp. in railway turntables.
944. E. Tomlinson, Manchester—Imp. in cop tubes, and in the machinery or apparatus to manufacture the same.
945. C. F. Vasserot, 45, Essex-street, Strand—An improved waterproof fabric. (A com.)
946. W. Clark, 53, Chancery-lane—Imp. in railway crossings. (A com.)
947. A. V. Newton, 66, Chancery-lane—Certain imp. in the construction of paddle-wheels. (A com.)
949. A. Winkler, Vienna—Imp. in printing or producing impressions in gold, silver, and oil-colours upon metallic plates, and in the mechanism employed therein.
950. J. H. Johnson, 47, Lincoln's inn-fields—Imp. in furnaces for the melting and reduction of steel, copper, zinc, and other metals. (A com.)

Dated 29th April, 1858.

951. J. Martin, Barmer, near Fakenham, Norfolk—Imp. in machinery or apparatus for reducing, cutting, or pulping roots and other substances.
952. S. Bartlett, 135, Lupus-street, Pimlico—Imp. in machinery for forming gutta percha soles and uniting them to the upper leathers of boots or shoes. (A com.)
953. E. Simons, Birmingham—Imp. in ordnance.
954. A. M. Perkins, Francis-street, Gray's-inn-road—Imp. in high-pressure steam engines.
955. C. Lawrence, Honley, near Huddersfield—Imp. in steam engines.
956. R. Johanny, Vienna—Imp. in the construction of furnaces.
957. W. Smith, 18, Salisbury-street, Adelphi—Imp. in spinning machinery. (A com.)
958. D. Auld, Glasgow—Imp. in working furnaces and steam boilers, and in apparatus connected therewith.

Dated 30th April, 1858.

960. R. B. Huygens de Lowendal, 69, Chancery-lane—Imp. in the construction of springs, and for their new application to the working of machinery.
961. J. Chadwick, Manchester, A. Elliott, West Houghton, Lancaster, and W. Robertson, Manchester—Imp. in machines for twisting and winding silk direct from the cocoons, such machines being of the class commonly known as throstles.
962. J. Lutz, 15, Welbeck-street, Cavendish-square—Proper apparatus for separating two substances of different densities; among others may be mentioned pit coal from the slate which it contains. (A com.)
963. B. E. Guyot de Brun, Pantin, Rue de Montreuil, 19, Seles, France—Leather tissue and other tissues rendered waterproof by a new process.

965. E. T. Hughes, 123, Chancery-lane—An improved regulated float combined applicable to the manufacture of paper. (A com.)

966. J. C. Faucon, Paris—Imp. in bedsteads, bed bottoms, mats, and articles for lying and reclining on.
967. J. Chapman, jun., North Foreland Lighthouse—Producing a substance entitled felted woody-fibre, convertible into useful articles, and applicable to the internal fittings and decorations of dwelling-houses.
968. G. H. Ellis, New Malton, Yorkshire—Imp. in cleaning boots and shoes by machinery, and in apparatus for the same, which is also applicable to cleaning other articles in domestic use.
969. W. Clark, 53, Chancery-lane—Imp. in obtaining motive power, and in the apparatus connected therewith. (A com.)
970. P. A. Godefroy, 3, King's-mead-cottages—Imp. in the mode of separating vegetable from animal fibres or fabrics.
971. C. A. J. Demanet, 43, Rue de la Science, Brussels—The extraction of coals and minerals from mines.
972. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in suspension bridges. (A com.)
973. A. Smith, Manchline, Ayr, N.B.—Imp. in valves.

Dated 1st May, 1858.

975. E. Wardall, Stanwick, near Darlington—Imp. in reaping machines.
976. R. Illingworth, Blackburn—Imp. in safety valves.
977. W. Spence, 50, Chancery-lane—Imp. in the production and application of a material called French purple, and in the process employed in obtaining it. (A com.)
978. L. Talabot, 54, Rue de la Chaussee d'Antin, Paris—Imp. in rolling railway and other bars.
979. W. Hopkinson and J. Dewhurst, Mayfield Printworks, Manchester—Imp. in apparatus for consuming smoke.
980. F. M. Gregory, Shavington, near Market Drayton—Imp. in chaff-cutting machines.

Dated 3rd May, 1858.

982. C. Schleicher, Bellerwallé, Prussia—An improved machine intended to make the points of needles, pins, and all other similar articles.
984. E. S. Trower, Stansteadbury, near Ware, Hertfordshire—Imp. in apparatus for treating flax, hemp, and other fibrous matters requiring like treatment.
986. J. G. Appold, Wilson-street, Finsbury-square—Improved apparatus for laying submarine telegraphic cables.

Dated 4th May, 1858.

988. J. Smethurst, Guide Bridge, Lancashire—Certain imp. in boilers for generating steam.
992. W. E. Newton, 66, Chancery-lane—Improved apparatus for mixing and moulding materials for the manufacture of fuel, parts of which apparatus are applicable to moulding bricks and other analogous articles. (A com.)

WEEKLY LIST OF PATENTS SEALED.

May 14th.

2864. G. P. Wheeler.
2866. J. Macintosh.
2874. J. F. Spencer.
2878. W. Gosage.
2881. W. Pidding.
2884. E. A. Brooman.
2885. R. A. Brooman.
2886. W. H. Bell.
2892. A. F., F. O., & J. Germann.
2894. R. Clegg.
2904. W. Clay.
2960. W. Blunkhorn.
2966. W. B. Taylor.
2980. J. B. Cooy.
3024. W. E. Newton.
3066. C. Cowper.
3058. J. Thornton.
3102. H. Johnson.
3170. J. H. Johnson.

118. J. Brown.

342. J. Davis.

474. J. E. Poynter.

May 15th.

2895. M. Booth and J. Farmer.
2906. W. Clay.
2915. C. L. West.
2918. H. Walker, J. Beaumont, and J. Gotherd.
2920. P. A. Bruneau.
2927. J. M. A. B. Fabart.
2943. R. W. J. Abbott and D. Mills.
2959. W. Elcock and S. Benthley.
3019. T. S. Adhead and A. Holden.
527. J. S. Russell.
661. A. A. Croll.
553. J. Biggs and W. Biggs.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

May 16th.

1062. J. H. Johnson.
1063. J. Steele.
1115. J. G. Butt & J. A. Martin.
1134. T. Piggott.

May 17th.

1091. R. S. Newall.
1098. W. Fawcett, J. Lamb, and F. B. Fawcett.

May 12th.

1070. G. Robinson.
1083. W. Robertson.
1089. J. Mason, S. Thornton, and L. Kaberry.
1123. E. Morewood & G. Rogers.
1085. R. McConnel.
1067. J. Buchanan.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4088	May 18.	Portable Combination Chair Stool, &c.....	Levi Stead.....	97, Norton street, W.
4090	" 19.	Fruit and Blossom Protector	Joseph F. Meston	Mundford, Norfolk.

Journal of the Society of Arts.

FRIDAY, MAY 28, 1858.

ARTISTIC COPYRIGHT.

A Petition to the House of Commons, praying an Amendment of the Law of Artistic Copyright, is now lying for signature at the House of the Society of Arts. Members and others interested in the subject are requested to call in a course of the ensuing week, to sign the petition.

WRITING CASE.

The Council regret that, after a careful examination by the Committee specially appointed report on the merits of the sixty-two writing cases sent in to compete for the Special Prize of twenty Pounds and the Society's Silver Medal, there are none which show sufficient merit to justify the Council in awarding the Prize. The Council have decided to invite further competition, and will shortly be prepared to announce the conditions.

LOCAL BOARDS—PREVIOUS EXAMINATION.

Fifty-seven Local Boards of Examiners have been formed. Returns of the Candidates who have passed the Previous Examination have been received, as follows :—

Louth	4
Wigan	6
West Hartlepool.....	3
Leeds (Christian Institute), No. 1.	14
Northowram	1
Portsmouth	2
Warminster.....	1
Banbury	2
Macclesfield.....	83
Newcastle-on-Tyne	3
Lymington	1
West Brompton	4
Leeds, No. 2.	10
Wakefield	4
Pembroke Dock	4
Ipswich	6
London Mechanics' Institution.....	8
Manchester Mechanics' Institution	32
Selby	9
Bradford	18
Halifax, No. 1.	15
Salisbury	1
Liverpool	35
Lockwood	1
Halifax (Working-Men's College), No. 2.	21
York	7
Berkhamstead	19
Bristol	11
London Domestic Mission	1

Royal Polytechnic Institution	29
Birmingham, No. 1, (Messrs. Chance's Reading Room).....	2
Sheerness	1
Sheffield (People's College), No. 1	15
Sheffield (Mechanics' Institution), No. 2 ..	3
Blackburn	5
Crosby Hall (London) Evening Classes..	25
Windsor and Eton	10
Greenwich	1
Institutional Association of Lancashire and Cheshire	100
Lewes	2
Brighton	3

The total number of Candidates who have been examined by the Local Boards, is 1,108. The number of Candidates whose names have been returned as desiring to attend the Final Examinations, is 337.

The Final Examinations, under the supervision of the several Local Boards, commenced on Monday last, and will conclude on Saturday next. A large number of the papers worked by the Candidates have already been received, and the awards will be made by the Society's Central Board of Examiners at the earliest possible date.

EXAMINATIONS.—PRIZES FOR 1858.

The following Prizes are offered to the Candidates, viz. :—

One First Prize of £5, and one Second Prize of £3 in each of the 26 subdivisions of the subjects of Examination.

No Prize in any subject will be awarded to a Candidate who does not obtain a Certificate of the first class therein.

The Prizes will be given in money or in books, at the option of the Candidate.

The following Prizes are offered to the Local Boards, viz. :—

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than ten) bear the largest proportion to its whole number of Candidates. —One Prize of £10.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than eight) bear the largest proportion to its whole number of Candidates. —One Prize of £8.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than six) bear the largest proportion to its whole number of Candidates. —One Prize of £6.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than four) bear the largest proportion to its whole number of Candidates. —One Prize of £4.

No Local Board can receive more than one of these Prizes.

These sums may be applied by the Local Boards to the payment of the expenses of the Examination, or otherwise, as the Board may deem best, for the promotion of the objects for which it was instituted.

SURGICAL INSTRUMENT COMMITTEE.

The Council have appointed a Committee to investigate the subject of Mechanical Contrivances applied to Medicine and Surgery—to promote improvement in their production—to determine and make known desiderata—to examine and report on the merit of apparatus submitted; and to recommend rewards for successful invention.

The Committee consists of the following gentlemen, with power to recommend other names to the Council:—

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|--|--|
| *Henry W. Acland, M.D.,
F.R.S. | John Marshall, F.R.C.S.,
F.R.S. |
| Neil Arnott, M.D. | William Allen Miller,
M.D. |
| Thomas John Ashton,
M.R.C.S. | Campbell De Morgan,
F.R.C.S. |
| *C. Metcalfe Babington,
F.R.C.P. | *Robert Nairne, M.D. |
| A. Whyte Barclay, M.D. | Richard Partridge, F.R.S.,
F.R.C.S. |
| Lionel S. Beale, M.B.
Lond. | Alfred Poland, F.R.C.S. |
| Thomas Bell, F.R.C.S.,
F.R.S. | Richard Quain, M.D. |
| *Charles Brooke, F.R.S. | Francis Ramsbotham,
M.D. |
| Frank Buckland, M.A.,
M.R.C.S. | Theophilus Redwood. |
| George Budd, M.D., F.R.S. | G. Owen Rees, M.D.,
F.R.S. |
| George Busk, F.R.C.S.,
F.R.S. | Samuel J. A. Salter, M.B. |
| *Samuel Cartwright, Junr.,
M.R.C.S. | Henry Savage, M.D. |
| *Thomas King Chambers,
M.D. | Francis Sibson, M.D.,
F.R.S. |
| *William D. Chowne, M.D. | John Simon, F.R.C.S. |
| *Wm. Coulson, F.R.C.S. | Alfred Smee, F.R.C.S.,
F.R.S. |
| *George Critchett, F.R.C.S. | John Snow, M.D. |
| *T. Blizard Curling,
F.R.C.S., F.R.S. | *Edward Solly, F.R.S. |
| J. E. Erichsen, F.R.C.S. | Samuel Solly, F.R.C.S.,
F.R.S. |
| Conway Evans, M.D. | Charles Spooner. |
| *William Farr, M.D. | Peter Squire. |
| *William Field. | *John Stenhouse, LL.D.,
F.R.S. |
| John France, F.R.C.S. | *Richard William Tamplin,
F.R.C.S. |
| John B. Fletcher. | Alfred Swaine Taylor,
M.D. |
| Robert Temple Frere,
F.R.C.P. | Theophilus Thompson,
M.D. |
| George Gulliver, F.R.S. | John Tomes, F.R.S. |
| *Francis Seymour Haden,
F.R.C.S. | Joseph Toynbee, F.R.C.S.,
F.R.S. |
| Mitchell Henry, F.R.C.S. | James Reeves Traer,
M.R.C.S. |
| William Aug. Hillman,
F.R.C.S. | Prof. Tyndall. |
| William Jenner, M.D. | Charles Vasey, L.F.B.S.
Glas. |
| George Johnson, M.D. | *Thomas Watson, M.D. |
| Henry Charles Johnson,
F.R.C.S. | Charles West, M.D. |
| W. Senhouse Kirkes, M.D. | *A. W. Williamson, M.D. |
| Edwin Lankester, M.D.,
F.R.S. | W. H. Winchester,
F.R.C.S. |
| *Henry Letheby, M.B.
Lond. | |
| James Luke, F.R.C.S. | |

* Members of the Society of Arts.

On Tuesday last, the 25th inst., this Committee held their first meeting, at which twenty-eight members were present. Mr. C. Wentworth Dilke, the Chairman of the Council, opened the proceedings by explaining at considerable length

the objects of the Council in appointing the Committee.

Mr. DILKE, in the course of his address, observed that the present Committee was one of a series established to watch and report on the continued progress of every Art represented in the Exhibition of 1851, and that its present reorganisation had especial reference to a more complete illustration of the subject in any future exhibition. The price of surgical instruments in this country was, he had been informed, considerable, in comparison with the productions of France, and though it might certainly be said that English instruments had an advantage in temper and quality, the question was, whether this advantage was commensurate with the great difference of price. The Council, in nominating this Committee, had endeavoured to include persons eminent in every branch of the profession, so as to afford material for the formation of special sub-Committees, which should each consist of at least three or four gentlemen. It appeared to the Council that the first especial duty of these sub-Committees would be to make a complete classification of the instruments and appliances at present in use in each branch of the profession, so as completely to illustrate the subject, and serve as data for future proceedings. The Council, in inviting the Committee to act, had thought it advisable to reprint and circulate amongst the members the epitome which had been prepared by a member of the Committee for the use of the staff of the Exhibition of 1851, which, however, the Council were fully aware, was imperfect, and merely suggestive. The Council were of opinion that the publication of a classified list would be in itself of great importance, and would tend to the more perfect representation of this branch of industry in any future Exhibition. It would also be the duty of the sub-Committees to examine apparatus submitted for approval, and report to the General Committee upon their merits. The sub-Committees would also have to determine desiderata, and to suggest to the General Committee the offer of rewards for successful inventions, or simplifications of existing instruments. It would now be the duty of the Committee to elect their chairman, and such vice-chairmen as they might deem necessary.

The Committee then unanimously elected James Luke, Esq., Chairman, Dr. Watson, Dr. Budd, Henry Charles Johnson, Esq., and Richard Partridge, Esq., Deputy-Chairmen, and Francis Seymour Haden, Esq., and Mitchell Henry, Esq., Reporters. The Committee then took into consideration the appointment of Sub-Committees

- On General Medicine.
General Surgery.
Dental Surgery.
Obstetric Surgery.
Ophthalmic Surgery.
Orthopædic Surgery.
Philosophical Apparatus applied to the investigation and treatment of Disease.
Veterinary Surgery.

TWENTY-FOURTH ORDINARY MEETING.

WEDNESDAY, MAY 26, 1858.

The Twenty-Fourth Ordinary Meeting of the One Hundred and Fourth Session was held on Wednesday, the 26th inst., Henry Thomas Hope, Esq., in the chair.

The following Candidates were balloted for and duly elected members of the Society :—

Binns, Richard William
Branthwaite, Harrison
Brown, William
De Mora, J. J.

Snowball, Joseph
Stickney, John, Jun.
Wilson, William
White, Henry

Wood, Nicholas.

The Paper read was—

ON THE INFLUENCE EXERCISED ON CERAMIC MANUFACTURES BY THE LATE MR. HERBERT MINTON.

By M. DIGBY WYATT.

In an insular country of limited extent, such as England, with an already large and rapidly increasing population, it will be probably conceded that the man who creates any new industrial resources must be a national benefactor. His contributions to the common stock of prosperity are no less essential to the well-being and consequent tranquillity of the state than are those levied by the course of public exigencies from the highest political functionaries, or the most philanthropic lawgivers. The wisdom, energy, courage, and devotion of the great soldier or sailor may defend a nation's prosperity, but it is only by an unintermitting exercise of the very same qualities on the part of its chief industrial organisers, that the prosperity which it is the privilege of the brave defenders of a country to protect, can be made to exist. This being the case, it is to be regretted that while in Great Britain national dignities and honours are ungrudgingly lavished on other celebrities, no laurels should be reserved for those whose abilities and energies in many instances have given bread to thousands who, but for them, would have gone to swell the squalid ranks of misery, if not of crime.

What the State leaves undone in this matter, it is the duty of the intelligent middle classes to supply, and hence it is that I feel justified in asking your indulgent attention this evening to my endeavours to depict the successful labours of the late Mr. Herbert Minton, whom it would be altogether unjust, as I conceive, to exclude from the honoured list of national benefactors.

There is probably no one here present unacquainted with the name of Minton, or ignorant of the branch of industry he did so much to elevate; few, however, are, I imagine, conversant with the exact nature of what was effected through his instrumentality. All products, introduced into general use, and supplied through thousands of different retail channels, become merged, in the popular idea, into one common stock; and while all may observe a progress more or less rapid in any special branch of industry, scarcely any pause to note the details of the manufacture, or to trace the originators of the successive modifications they can scarcely fail to observe. In order to lead you to an approximate estimate only of what the nature of the improvements effected during Mr. Minton's career really was, I must ask you to cast a rapid glance over the history of British Ceramic Manufacture previous to the year 1788, in which the late Mr. Minton's father established those works at Stoke-upon-Trent, in Staffordshire, which have become so celebrated under the energetic management of his son and successors.

The early stages of ceramic manufacture in England were marked by no great originality. In the production and ornament of porcelaneous or semi-transparent wares, very shortly after the year 1700 great excellence was attained on the Continent, at Meissen, Moscow, St. Cloud, Höchst, Doccia, and Chantilly; and although some evidence exists of the contemporaneous establishment in this country of the manufactories at Bow and Chelsea, a corresponding degree of excellence does not appear to have been attained in them at so early

a date. It was during the period between the years 1750 and 1765, that the Chelsea factory, with its soft and semivitreous paste, most successfully rivalled the great establishments of Vincennes (subsequently Sèvres), and Dresden. George II. was a liberal supporter of it, causing workmen, artists, models, and even materials to be procured from Saxony and Brunswick. In 1763 a magnificent service, the cost of which was no less than £1,200, was made for the King and Queen, under the superintendence of a foreigner, a M. Spremont, who directed the works for many years. On his retirement, about 1765, the manufacture was abandoned in London, and the principal workmen betook themselves to Derby, where an establishment had been set up in the year 1750, by a Mr. Dewsbury. In the following year a rival sprang into notice at Worcester, in the person of Dr. Wall, with whom a triumphant course of ingenious originality may be said to have been inaugurated in England. His principal invention is believed to have been that of printing on biscuit.

Up to the year 1768 no porcelain capable of bearing an extraordinary heat, and so hard as to resist scratching with a steel point, had been made in this country, for want of those materials which had, prior to that date, been discovered on the Continent, in Saxony, at Aue, by Böttcher, and in France, at St. Yrieix, by Madame Darnet. In the above-mentioned year the discovery of Cornish kaolin and pegmatite, by Mr. Cookworthy, of Plymouth, introduced a new element into the manufacture, and hard china was speedily made in considerable quantities at Worcester. From this parent establishment several others branched off, the most important probably being the Caughley Works, near Broseley, Shropshire, which were directed by John Turner, who joined them from Worcester, and who is stated to have discovered the art of printing in blue on china in 1780. It was under John Turner that Mr. Herbert Minton's father was brought up.

Such was the general aspect of the porcelain trade in England prior to 1788, and it remains to trace what had been done in the opaque earthen and stone wares. From a very early period pottery was made in Britain, and the art never appears to have been altogether lost. In the reign of Elizabeth, some dexterity was acquired, and specimens are extant evidently made of alip or clay brought into a fluid condition and cast into moulds. The Staffordshire "tigs" or drinking cups certainly abounded in her reign, and much rude pottery was subsequently produced from local plastic clay, occasionally ornamented with pipe clay patterns, and glazed with a coarse lead glaze. A great improvement on this common pottery was effected, about the end of the seventeenth century, by the brothers Elers, natives of Nuremberg, who discovered, at Bradwell, near Burslem, some fine red clay, with which they made a rude but close-grained Samian ware, which they ornamented with raised patterns, formed in copper stamps and glazed with a salt glaze, which they are believed to have been the first to introduce into England. The secrets of these Germans were discovered through a stratagem, by a man of the name of Astbury, and the foreigners were speedily ejected through local jealousies. To Astbury's son is accorded the merit of the discovery of the use of calcined flint in combination with clay, in the year 1720, and from that period commenced the manufacture of cream-coloured, buff, and dingy-white, stoneware—destined to speedily assume an altogether different and superior aspect under the master handling of the celebrated Josiah Wedgwood, who was born in 1730, and who died in the year 1795. He first set up in business in a very humble way at Burslem, in Staffordshire, in the year 1769, and the value and speedy popularity of the inventions he made within a few years of that date, supplied him, in 1771, with the means of founding his celebrated establishment at Etruria. The wares of Wedgwood are so well and generally known that it is unnecessary to dwell upon the

may suffice to remark that they were produced in great abundance and largely exported previous to the year 1788.

In spite, however, of various ingenious efforts, which cannot now be even enumerated, little that was good was produced in any considerable quantity previous to the close of the eighteenth century, excepting by the establishments of Bow, Chelsea, Derby, Worcester, Caughley, Leeds, Wedgwood and Spode, the latter through his judicious use of calcined bones and felspar, obtaining an enormous business in common but very good earthenware.

We shall now proceed to trace the development of the commercial house which the late Mr. Herbert Minton mainly raised into its present great importance. His father, Mr. Thomas Minton, who was a native of Shropshire, was brought up at the Caughley Works, near Broseley, as we have already observed, as an engraver. He then went to town and worked for Spode, at his London house of business in Lincoln's-inn-fields. In 1788, he came to Stoke, and bought land belonging to a Mr. Hasall, and built a house and works on the site, which has since become so celebrated. He entered into partnership, in 1790, with Mr. Joseph Poulson, who had been manager at Mr. Spode's works, which were at that time the principal in Staffordshire. The firm was joined, in 1793, by Mr. Pownall, who quitted it in 1800. Mr. Poulson died in 1809, leaving Mr. Thomas Minton alone to conduct the business. His second son, the subject of our present notice, was born on the 4th of February, 1793, in his father's house, which was then on the banks of the Trent. Up to the year 1798, earthenware alone had been made at the Stoke Works, and the staple of the business consisted of white ware ornamented with blue, in imitation of common Nankin, and in that branch of production the abilities and experience of Mr. Thomas Minton as an engraver had acquired for the firm a good commercial reputation. Mr. Herbert Minton was educated at Audlam School, in Cheshire. The manufacture of semi-transparent china was commenced in the year 1798, but owing to its proving unprofitable, that department of production was abandoned in the year 1811, to be resumed about 1821. In 1817, Mr. Herbert Minton and his elder brother, who subsequently entered the Church, were admitted into partnership with their father. About 1825, a marked improvement was effected in printed earthenware, both in the body, which was made whiter and purer, and in the glaze, in which borax, to a great extent, took the place of lead. Owing to family circumstances, Mr. Herbert Minton nominally retired from the firm, during the years from about 1823 to 1836, when, on his father's demise, he succeeded to the business; his brother having left the business to enter the Church, about the year 1821. Shortly after his father's death, Mr. Herbert Minton admitted Mr. John Boyle as a partner, who remained for about five years, and then joined the firm of Wedgwoods. Mr. Boyle's place at Stoke was taken by Mr. Michael Hollins. The last phase of the firm, for about ten years previous to Mr. Minton's demise, consisted of Mr. Minton and his nephews, Mr. Hollins, and Mr. Colin Minton Campbell. The business now remains in the hands of the two last named gentlemen.

Mr. Herbert Minton's industrial career, as assistant and principal, may be looked upon as extending over some fifty years of the present century, a period hitherto without a rival in the great history of civilisation—one of social progress and commercial development, of restless energy of thought and untiring labour, crowned by innumerable conquests of mind over matter. Of that apparently inexhaustible activity, intellectual and physical, which has formed the dominant characteristic of the past half-century, Mr. Minton offered a perfect type, and it was rather through this element than any other that his influence was so powerful as a stimulant and fertiliser. Neither a man of profound research nor an educated artist, neither an economist nor an inventor, by courage and ceaseless energy he brought to bear upon the creation of his ultimately colossal business, such a

combination of science, art, organisation, and invention as can be paralleled only by that rare union of qualities which impressed the stamp of genius upon his great predecessor, Josiah Wedgwood. A clear head, a strong body, rare powers of endurance and observation, a cool judgment in spite of a singularly sanguine temperament, a kindly nature, and genial manner, were the leading characteristics of Mr. Minton; and with such natural gifts, and an amount of perseverance to which I know no parallel in history (excepting, perhaps, that displayed by the celebrated potter, Bernard de Paliassy), he was enabled to benefit his country while building up his own fortune, and to do credit to the age in which he was born, thereby winning lasting honour for his memory.

Fifty years ago, Mr. Thomas Minton's establishment at Stoke gave employment to just about fifty hands, and at the date of his son's death upwards of 1,500 were in active occupation. It has been estimated by that distinguished authority, M. Leon Arnoux, that the value of our exports of ceramic manufactures, which amounted to £573,000 in 1840, cannot be now valued at less than £2,500,000, having more than quadrupled in the interim. To that rapid development Mr. Minton's activity largely contributed; and we shall now proceed to examine, in some little detail, the various branches in which he most strenuously aided, viz. :—

1. Earthenware and ordinary soft porcelain.
2. Hard porcelain.
3. Parian.
4. Encaustic tiles.
5. Azulejos, or coloured enamel tiles.
6. Mosaics.
7. Della Robbia ware.
8. Majolica; and
9. Paliassy ware.

As opportunities occur occasion will be taken to elucidate the remarks made on each section, by reference to the beautiful and very valuable collection of specimens kindly exhibited by Messrs. W. P. and G. Phillips, of Oxford-street and Bond-street, at present trading under the style of Chamberlain and Co.; and also by a few novelties forwarded from Stoke to the Museum of the Department of Science and Art. Mr. Hews, Messrs. Minton's superintendent at Albion-wharf, London, has also kindly selected and arranged, for our information, abundant materials for the illustration of the sections of encaustic tiles—Mosaic, Azulejos, and Della Robbia ware.

In the first place, then, it may be observed, that Mr. Thomas Minton's efforts and attention were limited to the improvement of earthenware and soft porcelain, to which the trade of the firm was almost exclusively confined until about 1830, the remaining branches having been all originated under the auspices of his son and his son's partners. Although the firm had closely followed the excellent practice of the great Staffordshire houses of Spode and Davenport, and had succeeded in vastly improving the aspect of blue printed earthenware, and manufacturing good current porcelain, for the most part in the style of old Derby, it was not until the above-mentioned year (1830) that any aristocratic patronage and attention were bestowed upon the house and its productions. It is still told with unction by the old workmen, how Mr. Thomas Minton was, like his son, a zealous patriot and good conservative; and that how, when the Duke of Wellington took a tour, with a brilliant suite, in the manufacturing districts, and made an entry into the town of Stoke, with the Duke of Sutherland, with whom he had been staying at Trentham, Mr. Minton turned out with all his workmen, and welcomed the hero of Waterloo as such a hero should be welcomed. The heartiness of the proceeding so pleased the dual visitors that they ordered the carriages to stop, and went over the manufactory, much to the delight of the work-

men. From that day forward a friendly and genial interest was taken in the progress of the establishment by the Duke and Duchess of Sutherland, whose example was speedily followed by Lord Harrowby, Lord Crewe, and many others of the nobility. The excellence of the bodies, glazes, gilding, and colours of the old establishments of Bow, Chelsea, Derby, and Worcester, left but little room for novelty and improvement, so far as excellence is concerned, to the Staffordshire manufacturers. The only path open to them was by greater economy in every process, and by carefully recognising and discriminating the talents of their workpeople, to endeavour to convert the class of goods which had been previously of altogether exceptional demand and production, into objects of ordinary commercial supply and demand. So far Mr. Thomas Minton certainly succeeded, leaving it to his son to rival, and indeed surpass, the models he had been content to follow at some distance. After the year 1825, when the Derby manufactory began to decline rapidly, many skilful workmen joined the Stoke Works, and the class of goods involving artistic decoration rapidly improved. Among the best painters employed by Mr. Minton at that time were Steele, Bancroft, and Hancock, in fruit and flowers.—Mr. John Simpson held the position of principal enamel painter of figures and the highest class of decorations from about 1837 to 1847, when he came to town to take charge of the department of enamel painting on porcelain at Marlborough House. Mr. Samuel Bourne remained as chief designer to the firm until 1848, when the growing importance of Schools of Design effected a change. The lead was then taken by M. Jeannest, until his lamented death; and here I should note Mr. Minton's deep appreciation of M. Jeannest's rare capacity as an industrial artist. Often and often he has acknowledged to me the especial obligations he felt himself under, both to M. Jeannest and to his friend and best counsellor, M. Arnoux. M. Carrier, a very clever sculptor, was subsequently employed to design many graceful objects; and M. Protât, well known through the part he took in the splendid sideboard, for which M. Foudinois gained his Council Medal at the Exhibition of 1851, is now the principal modeller. No less than fourteen of Mr. Minton's *employés* received medals and other rewards at the late Paris Exhibition. After the troubles of 1848 in France, Mr. Minton was so fortunate as to secure the co-operation and services of M. Leon Arnoux, a gentleman who had long enjoyed the reputation of being perhaps more profoundly versed in the mysteries of ceramic manufacture than any other *savant* in France. To that gentleman's zeal and ability, and the heartiness with which he entered into his principal's views, as well as the taste with which he realised them, Mr. Minton is indebted for a large share of the brilliant success of the efforts made by the firm for the Universal Exhibitions of London in 1851 and of Paris in 1855. A marked improvement also took place in the whiteness and transparency of the porcelain body, the beauty of the lustrous glaze, the purity of colours previously but imperfectly realised, such as carmine purple, bleu turquoise, gros bleu, bleu de Vincennes, pomme vert, rose du Barry produced by combinations of gold with salts of ammonia, and others. It is but just to remark here how warmly the production of this last-named tint, by Messrs. Rose, of Coalbrookdale, for Mr. Daniell, of Bond-street, was received at the Great Exhibition. The class of painting, too, was raised from the mannerism of work done by the dozen into that suited for objects designed to rise from ordinary utilitarian use into "*morceaux d'amateurs*," or choice ornaments worthy of the cabinets of collectors.

It may be well here to note how useful an element of social economy is to be found in the education of the workman, requisite to produce such porcelain as Mr. Minton lately caused to be decorated in vast quantities. *Wéyes* alone form an item of nearly sixty per cent. upon the cost of production of such objects, whereas for ordi-

nary fairly decorated earthenware, they would scarcely enter for one-half that rate. Hence the amount of employment afforded, and the comparative well-being of the workman.

An amusing illustration of the widely-spread reputation Mr. Minton's wares acquired for strength and soundness of manufacture, has been mentioned to me by one of the officers of this Society. On the occasion of one of the exhibitions of English manufactures, one of Pickford's carmen was delivering a lot of china at the entrance, and on his transferring it rather rudely from his waggon to the hall-floor, the officer naturally remonstrated, when the man replied, "Oh! never fear Sir; it's Minton's—it won't break."

As the members of the Society of Arts had an opportunity of judging of his rare knowledge and capacity, when M. Arnoux delivered, in this room, his able lecture on the results of progress in ceramic art manifested in the Great Exhibition of 1851, I need not say with what respect his verdict as to the credit due to Mr. Minton, for his products in fine and highly-decorated porcelain, exhibited in Paris in 1855, should be received.

M. Arnoux observes, in his Report to the Board of Trade, after briefly describing some of the leading features of Mr. Minton's exhibition, that:—"As Mr. Minton has obtained these magnificent results by his own unaided efforts, and at his own pecuniary risk, many persons do not hesitate to award as much credit to them as to the manufactures of Sèvres, which have required the co-operation of a large number of talented men, as well as of unlimited State funds. It was a piece of good fortune to Mr. Minton that both he and the Imperial Manufactory should exhibit, at the same time, vases of the old Sèvres design, because the advantage was, in some instances, upon his side, as his coloured grounds are quite pure, and his gilding brilliant and substantial."

M. Arnoux thus further vindicates the peculiar class of "body" out of which the English porcelain is almost entirely made, in contradistinction to the usual hardware or kaolin and petunee bodies of the continent, which last are entirely composed of infusible China clay, or decomposed felspar and a fusible flux, both materials existing in a normal form in nature.

"Certain very particular amateurs bring an objection against British porcelain, and say, that as it has phosphate of lime for its basis instead of being composed entirely of *pâte frittée*, it has no claim to be called *pâte tendre*. This objection appears to be nearly groundless. The chief beauty of the *pâte tendre* consists in the complete amalgamation of the colours with the glaze, and also in its capability of receiving certain tints which cannot be applied to any other kind of porcelain, such as turquoise blue, emerald green, and rose du Barry. If our porcelain combines these qualities in the highest degree—if its whiteness and transparency have been increased by the employment of phosphate of lime, who has any reason to complain? Our productions possess all the advantages of the old porcelain, and have, in addition, several accessory ones; we shall, therefore, do wisely to uphold this manufacture, since it brings us nearer to perfection."

We now proceed to the second branch of our subject, the hard porcelain manufacture, which, though through the discoveries of Cookworthy, extensively manufactured for a time, had been altogether abandoned in this country for the compound body just alluded to, until the year 1839, in which Mr. Minton, in conjunction with Dr. Turner, took out a patent for its manufacture.

The plan proposed, however, was not carried beyond a series of experiments until 1849, when, with the assistance of M. Arnoux, Mr. Minton resumed the attempt to make a body infusible, at very high temperatures, and of elements so pure as to be unaffected by ordinary chemical solvents. The renewed experiments succeeded well, that in 1851, vessels for the laboratory were ex-

ated by Mr. S. Wright, of the Staffordshire
eries, about thirty years ago, who took out a patent
as an original invention. It was some years
any good specimens could be obtained, but he
sufficiently to encourage the hope that success
be ultimately attained. This, however, was
ed for Mr. Herbert Minton, who purchased the
to effect. He set to work with a thorough English
mination to succeed, and with untiring energy and
erance, notwithstanding repeated failures, and
many difficulties and obstacles which presented them-
selves in his successive experiments, at length succeeded
producing tiles very far superior to those of the
erents. From the above hasty description the problem
manufacturing encaustic tiles does not appear, at first
to be attended with any great difficulty or com-
plicity; in practice, however, in the present day, the
is very far different. In the first place, clays have
to be mixed to burn with certainty to uniform tints
throughout their bodies. In the second, each of these
requires different tempering so as to correct the
varieties of shrinkage induced by the diversity of
materials mixed with the clays to obtain the required
tint, so that the filling-in in one-coloured clay shall
fall away and "craze" all over, or detach itself from
the base into which it is to be fixed by firing. In
the third place, the range of colours used by the potters
of the middle ages was limited to two—buff and red.
Recently, Mr. Minton added to this range—marone,
black, grey, and fawn, in through coloured
tiles; and blue, green, white, crimson, lilac, and
yellow, in enamels of porcelainous body, floated over
the surface of the tile slightly sunk to receive
relatively thin coatings of brilliant colours.

The difference in the shrinkage of the clays, while
drying, or from simple evaporation, and while
exposed to the heat of the fire, is an even
more difficult problem than that involved in the adjust-
ment of the materials for a compensating balance-
scale to a chronometer, or a pendulum to a clock, since
which does for the drying may not suit the firing,
vice versa. Dependent upon this nice balance of
conditions are not only the cohesion of the surface
about any gap or fissure, but the flatness of the tile as
a whole. This last quality may be also deranged by the
tiles not working equally, so that one side of a tile
sinks before the others. The remedy is chiefly derived
in an intimate practical acquaintance with the actual
shrinkage of the various materials, and not only so, but
of their various combinations. These last are not
easy, nor are they often, results that can be calculated
from the known constants of the separate materials of
which the tiles are composed, since those constants are
sometimes deranged by chemical action consequent on
mixture. Great practice, based upon costly experi-
ment, can alone give the necessary knowledge.

The great danger which the makers of encaustic tiles
are to guard against continually is the impending risk
of having a whole kiln full of valuable tiles spoiled in
the firing, for in order to bring out the colour and obtain
the requisite hardness of texture the fire must be carried
to the very verge of destructiveness, and by overstepping
that limit but a little, actual destruction to the tiles in
the kiln ensues. Moreover, until the kiln is opened, no
one can certainly tell what its fate may be. The crite-
rion usually adopted is the shrinkage of "trial pieces,"
which are tried by a gauge, and as soon as they will
go into the gauge, the kiln has been sufficiently fired.
Usually take four days and four nights firing, and
then three or four days cooling.

The following is a rapid summary of the processes
employed in Mr. Minton's perfected manu-
facture. The clay is entirely obtained from the immediate
neighbourhood of the Stoke works, and as was the case
in ancient practices, two different varieties are found
that any foreign admixtures to produce when fired

satisfactory red and yellow colours. Other tints are ob-
tained by adding to these and other bodies various me-
talloid oxides. In order to adjust these bodies to an
equilibrium of shrinkage, both in the kiln when fired
and after cooling, other materials, such as Cornwall
stone and clay, and alex from Kent, &c., are added, and
in their nice adjustment, as the greatest risk is incurred,
so is the greatest skill involved.

After the clays have been properly purified, and brought
into a liquid or "slip" state, they are passed through
fine lawn sieves, especially those which are to form the
surface of the tile. They are then boiled in the "slip
kilns" to bring them into a plastic state, ready for the
moulder. The pattern which is cast in relief in plaster
is placed in a metal frame, of a size sufficient to allow
for the shrinkage of the tile in the process of its manu-
facture (for a square of 6 inches the size of the mould
being $6\frac{1}{2}$ inches square). The surface of the tile is
formed of fine clay flattened out, and $\frac{1}{2}$ inch thick. This
being pressed on the plaster pattern, of course receives
an exact impression of the design in "entaglio." The re-
quisite thickness of the tile is gained by adding upon
this first layer of fine clay, clay of a coarser kind,
half an inch thick, covered again by a stratum
of the same clay which forms the face, so as to counter-
act its shrinkage, which would otherwise pull the tile
into a curved section. The whole is then put under a
press to give it sufficient solidity. This being done the
colours required in the pattern are added by pouring the
coloured clays in a slip state into the parts of the inden-
tation intended to receive them according to the design.
The slips flood the surface of the tile, and thus for a time
obliterate the design altogether. In this state they are
left three days, until the water has nearly all evaporated,
when the surface is carefully scraped and planed until
the pattern is again seen, and all unevenness removed;
but still there is no great difference of colour discernible
in the clays which form the surface of the tile. After
this the tile is left in the drying house for a fortnight to
three weeks, when it is taken to the oven, and there for
60 hours is submitted to an intense heat, which brings
out the colours. The tile is then finished, unless it is
required to be glazed, which is done by simply dipping the
surface of the tile into the glaze, and then placing it in a
glazing oven to be refired.

The requirements of modern art have been met in the
production of bright blues, greens, &c., by inlaying
with a porcelain body coloured by means of oxides of
cobalt and chrome, and a mixture of chrome and zinc.
The introduction of the colours involves some not in-
considerable manufacturing difficulties. For instance,
there is no red clay known (excepting those of Stafford-
shire and Broseley) which will satisfactorily bear the
amount of fire requisite to bring out some of the last
named vitreous colours, and even with them the risk and
loss is frequently serious, and the compensating process
varies as the qualities of the clay which forms the body
to be inlaid. One of the many causes of the coarseness
of these vitreous colours as applied to tiles, is the great room
tiles so coloured occupy in the kiln, the face of each
being protected by a plain tile, which has no value for
any other purpose.

The contact of certain colours in the same tile is usually
incompatible; for instance, green next to buff, as the buff
is stained by the green. No tiles ought to be fired face
to face, as the colours, to use a printer's term, "set off"
even where the faces are not in actual contact. The
volatilization of the metallic oxides will produce a
clearly defined image of one tile on the face of its op-
posite; and this vaporization has a tendency to affect the
general tone of colour of the tiles confined in the same
"sugar" or fire-clay box in which they are burned.

The evil tendency of substances usually considered the
most fixed in nature to resolve themselves into "thin
air," under the power of intense heat, compels the potter
to saturate with glaze the inside of the sugars in which

glazed goods are fixed, in order to hinder the absorption of the vaporized glaze of his goods by the dry and thirsty substance of the sugars. A glazed tile fired in an unglazed sugar would be robbed of all its lustre. These difficulties have suggested the practice of that slight kind of glazing technically called "smearing," in which the whole quantity of glaze is applied by smearing, not the goods to be glazed, but the inside of the sugar containing them. Heat is applied sufficiently intense to volatilize the glaze, and to prepare the surface of the goods to appropriate it to themselves in its vaporous state. The subdued glaze upon chemists' mortars and upon some encaustic tiles, is obtained by this process.

Towards the expiration of the term for which the patent had been taken out originally by Mr. Wright, Mr. Minton permitted Messrs. St. John, Flight, Bar, and Chamberlain, of the Old Worcester China Works, to manufacture encaustic tiles under a license. They were, however, at first, under the great mistake of supposing that any kind of clay, or at least that the clays around Worcester would do for the purpose. Finding that these would not answer, they were at last compelled to send to the celebrated clay beds of Broseley for their materials, thus increasing the cost of the tiles produced. This Company, abandoning the manufacture, was succeeded by Messrs. Maw and Co., who soon perceived the disadvantages under which their predecessors had laboured; and therefore determined to remove their works to Broseley, and thus to plant themselves in the immediate vicinity of those clays which have no rival in this country, except in the neighbourhood of Messrs. Minton's works in Staffordshire.

Mr. I. H. Maw, to whom I am indebted for much valuable information in respect to the encaustic tile manufacture, informs me that he was first led to the subject whilst upon a visit to the parish of Westleigh, North Devon, at the time when the old tiles of the church were being taken up. He has still by him the first step he made in his attempt at reproduction, in the shape of a mould carved in one of the Westleigh patterns out of a block of slate.

Among the most important pavements of encaustic tiles executed by Mr. Minton may be pointed out those of the Houses of Parliament, of Osborne, of the Hall of Assembly at Washington, in America (a pavement of vast extent and elaboration, entirely designed and worked out by Mr. Green, who has now charge of the Drawing Office); of the St. George's Hall, and Town Hall, at Liverpool (produced under the practical direction of Mr. Eyre, who preceded Mr. Green); and of the cathedrals of Ely, Salisbury, and Gloucester. Far and wide over the land, in churches, chapels, halls, private dwellings, and public institutions of all kinds, these beautiful tiles have been laid down, and have given universal satisfaction. Indeed, the measure of success has been in the exact ratio of the difficulties overcome, difficulties which Mr. Minton declared he would surmount, even "if the manufacture of every single perfect tile cost him a guinea."

Having achieved so great a success in his encaustic tiles, Mr. Minton turned his attention to the fifth branch of ceramic art we purpose dwelling on to-night, the Azulejos, or decorative tiles of an earthenware body, covered with opaque white enamel, and coloured in varying thicknesses of transparent enamel tints of the greatest possible brilliancy.

It is to the Arabs, who, probably, derived the art from the Persians, that we are indebted for the introduction into Europe of these beautiful coloured tiles, of which so many specimens still ornament the walls of the Moorish buildings in Spain. In these the patterns are defined by ridges raised above the surface of the tiles, circumscribing hollows, which are partially filled with a thin layer of enamels of various colours, the whole tile having been previously covered with a white "staniferous glaze." Some specimens of coloured Spanish

tiles, of the same kind but more recent date, are to be seen in the museum of the Hotel Cluny; of these many are ornamented in the renaissance style or with finely drawn heads. These are chiefly blue upon a white ground, while other specimens, like the tiles of the eleventh and twelfth centuries, have simply an incised pattern stamped upon them. By a careful examination of some fragments of azulejos brought to this country by Mr. Owen Jones, and of those which form the well-known pavement of the Mayor's Chapel, at Bristol, Mr. Minton was enabled to ascertain the process by which they had been made, and he had little difficulty in arriving at most satisfactory results. How perfectly he succeeded must be obvious to all who have ever examined the beautiful pavements and dados of the Alhambra Court in the Crystal Palace. Various modifications of azulejos, some perforated and others modelled into foliage, were introduced at the suggestion of the late Welby Pugin, who, in this department of ceramic art, as well as in improving the designs for porcelain slab paintings, printed earthenwares, and encaustic tiles, had been of great assistance to Mr. Minton. Their enthusiastic natures were, indeed, so kindred, that their business relations speedily ripened into fast and enduring friendship. It is to be regretted that, with a few notable exceptions, architects have not adopted this beautiful manufacture as they ought.

Our sixth section comprises the revival of geometrical mosaic as a structural adjunct. This revival may be said to have commenced in 1839 and 1840, with the attempts of Mr. Blashfield to produce satisfactory pavements by the employment of coloured cements, inlaid asphaltes, and Venetian Pisé work; with the clever inventions of Mr. Singer, of Vauxhall, aided by his ingenious assistant, Mr. Pether, and last, but not least, with that brilliant idea of Mr. Prosser's, of solidifying China clay in dry powder, by subjecting it to great pressure in iron moulds from which it could not escape, and thus, at the same time, avoiding the shrinkage due to the evaporation of the moisture previously indispensable to keep the clay in a plastic state, and obtaining, by the forcing together of the molecules, a substance of extraordinary density and evenness of texture throughout its body. Quite recently, I may here mention, a process has been invented by Messrs. Maw and Co., who are now actively engaged in the mosaic business, whereby that closeness of texture, and consequent hardness of surface, only to be obtained by aqueous shrinkage, may be given to tesserae, hitherto dependant for hardness upon the mechanical pressure of materials in a dry or nearly dry state. Of Messrs. Blashfield's, Singer's, and Prosser's abilities, Mr. Minton availed himself largely. Mr. Blashfield carried on an active agency for him in London. From Mr. Singer he took out a licence for a patented system of laying small tiles and tesserae, and in Mr. Prosser's patent he became largely interested. The object for which Mr. Prosser's presses were first set to work were the manufacture of buttons of different kinds, and for some time a very large trade was driven in this department of industry. Subsequently, however, the ingenious automaton machine, invented by M. Bapterosse, of Paris, by means of which multitudes of buttons are made at every stroke of the die, and at once carried off into a reverberating furnace by means of which they are fired in about ten minutes, superseded Mr. Prosser's original form, and Mr. Minton abandoned the manufacture of buttons. It was, I believe, Mr. Blashfield who suggested to Mr. Minton the applicability of the process to the production of tesserae, or small cubes, suited for the formation of tessellated pavements, in imitation of those of the ancients. Mr. Minton went into the matter with great spirit, and excellent tesserae of all colours were speedily made. For their arrangement Mr. Owen Jones suggested many very beautiful geometrical combinations. In the winter of 1844 I went abroad to study my profession, and took with me a commission from

Blashfield to collect for him any thing I might meet with calculated to assist in utilising these tesserae, upon the manufacture of which Mr. Minton was at that time entering. Finding in Italy and Sicily a good deal of material to which, as far as I could ascertain, no one had previously paid much attention, I was induced to make the series of drawings subsequently published in my work on the "Geometrical Mosaics of the Middle Ages." Mr. Blashfield having shown the drawings to Mr. Minton during my absence, on my return, in the spring of 1847, I found the latter anxious to employ me to assist in the extension of his views, both with respect to tessellated work in general and its combination with encaustic tiles. My first interview with Mr. Minton was in reference to the pavement for Osborne, upon which he consulted me professionally, and from the date of that interview until his death I was happy in securing his kindly interest and regard. The drawings I made for him in consequence of that interview are exhibited this evening. It was through Mr. Blashfield and Mr. Minton that I was induced to present myself, for the first time, as a lecturer in this room, on the 3rd of February, 1847. When, in 1849, I had the distinguished honour to be employed by this Society to examine for them and report upon the Parisian Exposition of that year, and upon the system of expositions as conducted in France, I had the good fortune to examine the whole of the ceramic products with Mr. Minton very carefully; again at Birmingham in 1849; in this room, at the Mediæval Art Exhibition; in Hyde-park, in 1851; and at Paris in 1855; I had similar good fortune: and I can certainly say, that, not in the branch of mosaic alone, but in every direction in which it is possible for ceramic products to be applied to art purposes, Mr. Minton's zeal and interest were, if possible, more keen and sanguine in 1855, when all that he could have hoped for ten years previously had been crowned with success, than they were when he stood upon the threshold of his first and happiest introduction of novelty and improvement. Having dwelt at length upon the various processes connected with mosaic work, in a paper printed in the Society's Transactions, new series, Vol. I., I need not detain you in reference to them; neither is it necessary for me to dwell upon the excellence, beauty, and durability of nineteenth century mosaic, so long as the pavement of your hall, the tesserae for which were presented by Mr. Minton, remains in its present perfect and elegant condition. The central feature of its design is based upon one of the drawings I made for Mr. Blashfield, from the church of San Bartolomeo nell' isola del Tevere, Rome. The design, and the laying down of this pavement, which is a first-rate piece of work, were presented by Mr. Blashfield. Among all the numerous pieces of excellent tessellation carried out by Mr. Minton, I think I may point to the pavement of the Atrium and Tablinum of the Pompeian House, in the Crystal Palace, executed from my designs, as at once the best, the best known, and the one of which he was the most proud.

Time warns me to proceed, without delay, to the remaining very important sections of our subject. These, respectively—Luca della Robbia ware, Majolica, and Paliase ware—though each possessing distinct characteristics in point of art, and claiming attention for excellencies, either of design or fabrication, special to each—have yet so much in common, that it will be best, and probably clearest, to advert to them as a group. Theoretically speaking, the basis of manufacture is common to all three—viz., a calcareous clay body, covered with an opaque white enamel, composed of sand, lead, and tin—colours being added by enamelled glazes.

At this distance of time it is difficult to determine whether the manufacture of Majolica ware was derived by the Italians from Sicily, Greece, or Majorca, or whether they owe the fabric to the improvements introduced by Luca della Robbia early in the fifteenth

century, previous to which the pottery of Umbria and Tuscany was a common earthenware, covered with an opaque veneer, made from a white clay found in the province of Sienna, and known as "terra di San Giovanni." When covered with this revêtement, the vessel was heated till the outer coat was reduced to a state of "biscuit;" it was then covered with a glaze, in which any colour desired was mingled, or the white coating was ornamented by painting in enamel colours, which were then covered with a transparent glaze. A final baking vitrified the colours and glaze, thereby rendering them permanent. Wares so produced are known to connoisseurs as "Mezzo-Majolica." Amongst many other improvements, Luca del Robbia substituted, for the original coating of white clay, a thin opaque glaze composed of sand and tin, with a small quantity of antimony and other metallic substances. Through his rare talent as a modeller, his ware attained an extraordinary popularity, and was used extensively as a beautiful architectural adjunct throughout Tuscany. Some idea of the scale upon which this material was employed may be obtained by an inspection of the great frieze from the *Opedale dei Poveri*, at Pistoia, a reproduction of which surmounts the Renaissance and Elizabethan Courts at the Crystal Palace. Our modern architects have singularly neglected to avail themselves of Mr. Minton's beautiful revival, and I believe that my use of it at the Paddington Station, and in one or two other places is almost unexampled. Luca della Robbia's process appears to have been known to the Arabs in the thirteenth century, and is believed to have been in their possession as early as the ninth century.

An extensive trade in vessels of Majolica ware was carried on in Italy in the sixteenth century, principally in the Duchy of Urbino, whose duke, Guid'Ubaldo della Rovere, in 1509, granted a patent to Giacomo Lanfranco, of Pesaro, for the application of gold to the ornamentation of earthenware. Asciano is considered by Passeri to have been the first town in Italy possessed of an established manufactory of Majolica ware, but at the date referred to a very large quantity was produced in the towns of Perugia, Rimini, Spello, Bologna, Sienna, Forlì, Civita-Castellana, Faenza, Gubbio, &c., in the last mentioned of which some years later a series of improvements were introduced into the manufacture of this species of pottery by Maestro Georgio Andreoli, who introduced a splendid ruby colour into his draperies. When completed, the painting was often covered with a glaze, which in firing, gave a peculiar brilliant metallic and prismatic lustre to the surface of the object fired. Vincenzo Andreoli, the son of Maestro Georgio, carried on and still further improved his father's manufactures.

Majolica were attained great perfection under the Fontanas and Baptista Franco, declining in excellence under the too facile hands of the Zucchari.

During its best days—between the years 1520 and 1560—the engravings of Marc'Antonio, Marco di Ravenna, and others, from the designs of Raffaele and Giulio Romano, became diffused throughout the country, and were eagerly seized upon and applied to the decoration of the ware which at that time was largely used by the Italian nobles for their tables as well as for ornamental purposes. Timoteo della Vite, one of Raffaele's favourite pupils, is said to have greatly improved the forms and ornaments of these vessels. Some specimens of Majolica ware, which had formed part of the collection of the Duke of Buckingham, having come into Mr. Minton's possession, his attention was directed by them to a revival of the art, with what success is shown by the various beautiful productions which adorn the room this evening.

For much of the success of this revival, Mr. Minton was indebted to the consummate knowledge of enamel colours and glazes, as well as to the taste and judgment possessed by M. Léon Arnoux. His brilliant success in Paliase wares, in highly decorated earthenware and encaustic tiles, unquestionably won for the firm

indeed, he did not know in what position England would have stood as regarded this branch of art in 1851 and 1855, had it not been for him. He (Mr. Crace) could not call to mind any former occasion in which British art was so completely vindicated as on that when the gold medal was awarded to Mr. Minton at the Paris Exhibition. 'His dessert service, exhibited in 1851, was rightly esteemed by the Queen as a fitting present to the Emperor of Austria, and at the Paris Exhibition in 1855, so highly were the works of Mr. Minton appreciated that there it was scarcely possible for an article to remain an hour without its being purchased, so anxious were people to secure them. In fact he thought the appreciation of those works was higher in Paris than in this country. Mr. Minton was always in advance of his time. He appreciated and enjoyed all that was beautiful, and felt a delight in realizing the most exquisite designs that were brought under his attention. As an illustration of this remark, Mr. Crace mentioned that on one occasion being shown a plate of exquisite design and manufacture, Mr. Minton was challenged to produce its equal. Having obtained possession of one of those plates, he took it away with him and succeeded in producing an article fully equal in all respects to that upon which the exercise of his skill had been challenged. There was that sort of happy, industrious, energetic character about the late Mr. Minton, which was rarely to be met with. All who knew him must deeply deplore his loss, and in this society he would be particularly missed. As regarded his works they spoke for themselves. Many present would remember the large fountain which Mr. Minton exhibited at Paris, and the elaborate manner in which it was ornamented; and in the ordinary mercantile productions, such as tea and breakfast services, such was the advance made by Mr. Minton, that they excelled that class of French manufacture, taking price into the comparison as well as quality; and the same might fairly be said of his enamelled earthenware articles. In fact, taking his productions altogether we had reason as Englishmen to be proud of our departed friend. He had not only earned a reputation which would probably live as long as this country remained; but he had greatly aided in gaining for England the respectable position she had now attained in the arts.

Mr. DANIELL felt considerable diffidence in obtruding himself upon the attention of the meeting, but he wished to testify his sympathy with the object for which they had been called together. The late Mr. Herbert Minton he had had the pleasure and the honour to claim as a friend from boyhood. He had enjoyed his society as much as any other man of his age connected with ceramic manufactures, and on that memorable occasion in 1855, when Mr. Minton representing himself, and he (Mr. Daniell) representing an equally important firm, were in Paris, they lived together in the same house and were the best of friends. To speak of the late Mr. Herbert Minton as a man, would be only to do that which had often been done before. His goodness was known to all, and his liberality was experienced by every one who needed it. When they came to speak of him as a public man and as a manufacturer, it needed not his feeble voice to say one word in his praise. His productions spoke for themselves; but though a great man had fallen from amongst them, yet greatness itself was not dead. There were others upon whom it was to be hoped the mantle of the departed had fallen, and he trusted his audience would give him credit for sincerity when he said that, though this might be regarded as the funeral eulogy on Mr. Herbert Minton, he could not look upon it as the funeral oration of ceramic manufacture. The advantages which the late Mr. Minton possessed, were such as few ordinary men could obtain. Beloved by all—generous himself to all—anything he asked for was at his command. He (Mr. Daniell) recollected some years ago asking to be allowed to copy the design of a cup and saucer in a celebrated collection, but he was refused on the ground that

the value of these articles would be thereby depreciated. The late Mr. Minton, however, had been differently treated, for there was scarcely a subject in any collection which he was not allowed to copy. With reference to Mr. Minton's predecessors in the branch of art, he might remind the society of one whose name was upon their records as the recipient of the society's gold medal for china and porcelain manufactures long before Mr. Herbert Minton's time. He referred to John Rose, of Coalport, who made more china in his day than all those who were mentioned in the paper. His successor still lived in the person of his nephew. It must also be remembered that there still lived in the late Mr. Minton's firm the man to whom that gentleman was always ready to acknowledge his great obligations, Mr. Michael Hollins, but for whose genius the splendid productions then before them would probably never have reached the perfection they had done.

Mr. HYDE CLARKE congratulated the Society upon the able and eloquent paper which had engaged their attention that evening. He had no contribution to offer on this subject beyond bearing his humble testimony to the readiness of the late Mr. Herbert Minton to furnish specimens or designs with a view to the spread of this branch of art manufacture. As a member of this Society he wished to express his obligations to Mr. Digby Wyatt for the paper he had brought before them, which he agreed with the last speaker in not regarding as the funeral oration of ceramic manufacture, but as a well merited tribute to one who had rendered eminent service to his country. It was only in that character that he understood the address of Mr. Digby Wyatt, and as the orator of the Society on this occasion, he had paid a well merited tribute to the memory of Mr. Herbert Minton. He also congratulated the meeting on being presided over by a gentleman who, by his personal patronage and influence, had for many years laboured so successfully to promote the manufacturing arts of this country.

Mr. GEORGE WALLIS said, as one who had the privilege to know the late Mr. Minton, and who admired his energy and earnestness, he could not but thank his friend Mr. Wyatt, personally, for his noble paper. For some years past he (Mr. Wallis) had been in the habit of meeting Mr. Minton from time to time, and he saw much of him in the United States of America in 1853, and at Paris in 1855, and could bear full testimony to the truth of the eulogy which had been pronounced. He thought some mistake had arisen as to the true purpose of the paper, which was not on the general progress of ceramic art, but on Mr. Herbert Minton's special share in that progress. Other eminent firms had done much, such as its own special department. Copeland's, under the able direction of Mr. Thomas Battam, Messrs. Rose, of Coalport, in their way, whilst the old house of Chamberlain's of Worcester, now so ably represented by Kerr and Bunn, had a position of its own, but the work of none of these was negatived, because Mr. Minton's labours were more distinctly traced out. Mr. Minton's reputation was of too pyramidal a character to need any extraneous aid by detracting from, or neglect of, others. He (Mr. Wallis) could undertake to speak from personal observation of the work Mr. Minton had done in the Staffordshire Potteries at least. It was in 1837, 21 years since, that he first visited that district, and though young in years then, and still younger in his knowledge of art, yet he could not conceal from the manufacturers the disgust and wonder with which he regarded the amount of ugliness they contrived to get into and upon a beautiful material. Nine years after he visited the potteries again. In the interval a great change had taken place, thanks to Mr. Minton and to Mr. Thomas Battam, acting for Copeland's house. Nine years later, in 1855, they all knew what resulted, and he had no hesitation in saying that but for Mr. Minton, the beautiful display of Majolica ware, at least, then before them would have had no ex-

ance. He thought it was a most fitting thing for the society of Arts to have afforded an opportunity for this eulogium on such a man after his death. We had too little of this in England. The only eulogy usually heard was "Well, he is gone, poor fellow! How much money he has left behind him?" as if he could take any of it with him. Something like this had been already said about the subject of the memoir of that evening. It was said that Mr. Minton had added worth "so much" money, at that the greater portion was invested in moulds and models; as if they were not good property in good hands. Mr. (Mr. Wallis) trusted, however, that the time would ever come when some future ultra-utilitarian partner of his now eminent firm might serve them as Wedgwood's models and moulds were served—cast them off the remises at Stoke as old plaster.

Mr. MR. BLASHFIELD, having been for many years intimately associated with the late Mr. Herbert Minton in the revival of the ceramic art, would say a few words on the recent occasion. In 1839, attempts had been made to introduce improvements in the pavement and decorations of public buildings, and Mr. Minton took out a patent for encaustic tiles, in the production of which his success was so well known. About the same period he (Mr. Blashfield) had the honour of laying down, in the saloon of the chairman's beautiful residence, a Venetian pavement, and he was indebted to that gentleman for some very valuable suggestions on that subject. He (Mr. Blashfield) had had much to do with the revival of coloured pavements; and he at first tried to cut the tiles or that purpose, much in the same way as bakers cut out their biscuits, but all his attempts were unsuccessful. Subsequently his attention had been drawn to some very beautiful buttons, which, he was then informed, were made of clay pressed between steel dies, without any moisture, according to the method invented by Mr. Prosser. It struck him that the same process would be applicable to the making of tiles, and he brought the subject under the notice of Mr. Minton and Mr. Hollins, and learned from them what had been done in the matter. He agreed with Mr. Daniell that the proper amount of red had hardly been given to Mr. Hollins for the share he had contributed in the advancement of this art. In his communications with that gentleman he was informed that instead of the clay being used dry in Mr. Prosser's process, the moisture was forced out from between the tiles. He believed that it was to Mr. Hollins's scientific knowledge, combined with his great industry, they were mainly indebted for the improvements that had been effected in the art of making mosaic and coloured pavements, which emanated from the attempts that were then made to make good encaustic tiles. The public were not aware how much had been done by Mr. Hollins towards perfecting those beautiful specimens which they exhibited that evening. Mr. Minton, urged on in some degree by the zeal and energy of Mr. Pugin, had determined to improve the manufacture of encaustic tiles, and he succeeded in bringing the coloured tiles to such perfection as to call forth expressions of enthusiastic delight from Mr. Pugin, who exclaimed to Mr. Minton, "You shall have a brass plate that." Mr. Minton was so determined to revive the manufacture of the ancient tiles and aware that, although dissuaded by Mr. Prosser from making the attempt, he persevered; indeed, had it not been for his determination, the beautiful machine of Mr. Prosser would have been applied solely to the manufacture of buttons. The first piece of this mosaic pavement was laid down by him (Mr. Blashfield) in the London Coffee-house, on Ludgate-hill, in 1841, and afterwards was applied at the London Bridge Hotel, and in some of the houses of the higher classes. In the following year, the machine of Mr. Prosser was worked in the Society's hall, and some of the pavement made by it was put together according to some drawings made by Mr. Owen

Jones. In 1843, the then largest specimens of mosaic pavement were exhibited at the soirée of the Marquis of Northampton, and the Prince Consort, being much pleased with them, requested to be supplied with a particular account of the process employed; a report upon the subject was drawn up by Mr. Prosser, and transmitted to Buckingham Palace. The introduction of that material for paving, and the attention it had attracted in high quarters, led to a demand for it, which could not be met, as Mr. Prosser was not at that time able to supply a sufficient number of machines. In 1845-6 the same description of pavement was laid down in York Minster; indeed, all must acknowledge that Mr. Minton had done very much more for the revival of the mosaic pavement than anyone else.

Mr. B. WATERHOUSE HAWKINS did not rise for the purpose of adding anything to the eulogium that had been passed upon the late Mr. Minton, but he wished to congratulate the Society upon the very graceful manner in which that most legitimate function had been discharged by Mr. Digby Wyatt on the present occasion. To know the late Mr. Herbert Minton was to love him. His works were before them, and it was impossible for any words to add to the appreciation of their beauty, or of the indomitable energy which led to their production. If Mr. Digby Wyatt had omitted anything it might be that he had not had time to speak of that great faith and confidence which Mr. Minton so pre-eminently possessed in works in which he detected the true spirit of art, which art he fostered and carried to a point which had not only raised his own reputation, but that of the country in which he lived.

Professor TENNANT had had the privilege of a thirty-five years' acquaintance with the late Mr. Herbert Minton. As an illustration of the perfection to which Mr. Minton carried his productions, he might mention that having been struck with the beauty of some designs he saw at Frankfort, he secured them, and on placing them before Mr. Minton, he found that they were his own work—the earliest specimens of them having been sent to Frankfort, where he (Professor Tennant) was first attracted by them. He joined his testimony to that which had been already given as to Mr. Minton's readiness to impart the fullest information with regard to his manufactures to all who were desirous of obtaining it.

The CHAIRMAN said he believed the hour had arrived when it would be acceptable to the meeting that this discussion should be closed. He certainly thought that they had been very fortunate in hearing the paper read on this occasion, but he likewise thought it fortunate for the memory of the late Mr. Minton that the subject had fallen into the hands of the gentleman who had addressed them that evening. It was undoubtedly the case in England that a man who, in works of this description, deserved well of his country, and conduced to its prosperity, could only look to some appreciation of this kind at the hands of his fellow-countrymen. He would not receive public rewards—he might not look for public distinction. Those things were reserved for feats of arms and success in warfare, for social position and high distinction in the political world. They were not bestowed upon men who advanced arts, who promoted science, and who deserved well of their country, in this perhaps more humble, but not less useful walk. Under these circumstances it was fortunate when a gentleman so well able to do justice to the subject as Mr. Digby Wyatt, took it up. They might say, in the words of Horace:—

"Vixere fortes ante Agamemnona
Multi; sed omnes illacrymabilem
Urgenter ignotique leida
Nocte, carent quia vate sacro."

They had the *Agamemnon*, and also the poet in this case, and they would best show their gratitude by returning to Mr. Digby Wyatt their sincere and heartfelt thanks.

for the very admirable manner in which he had treated this subject.

The vote of thanks having been passed,

Mr. DISBY WYATT acknowledged the kind manner in which the thanks of the meeting had been conveyed to him, and explained the circumstances which had led to his having been asked to read this paper. The task was to him a labour of love, and to enable him to accomplish it successfully, he had been furnished with much useful information by the surviving partners in Mr. Minton's firm. With respect to the mention of other manufacturers, in giving to the late Mr. Minton the prominent place he had afforded him, he (Mr. Wyatt) had only followed the awards of the juries of the Exhibitions of 1851 and 1855, and he would remind the members that the object of his paper was not to trace the progress of ceramic manufacture, but to point out the influence which had been exercised upon it by the late Mr. Minton, one of his oldest and dearest friends.

The paper was illustrated by numerous designs for pavements, and specimens of porcelain, Majolica, Parian, and tiles of various kinds, manufactured by Messrs. Minton and Co., and kindly contributed by that firm, as well as by Messrs. W. P. and G. Phillips (Chamberlain and Co.), and the Department of Science and Art. To all these contributors the thanks of the Society are specially due.

The Secretary announced that this was the last Ordinary Meeting of the Session, and that the Annual General Meeting of the Society would, in accordance with the bye-laws, be held on Wednesday, the 30th of June, at 4 P.M.

Home Correspondence.

MR. HYDE CLARKE'S PAPER ON INDIA.

SIR,—Mr. Hyde Clarke, in his paper "On the English Settlements of the Hill Regions of India," read to the Society of Arts last evening, referred to myself and some other persons to make some observations to the meeting, but these we were precluded from offering before the time for closing the discussion had arrived.

An allusion was made to the paper "On the Revenue and Taxation of India," which I had read to the Statistical Society on the previous evening, and to the section of it bearing upon the question of land-tax redemption. Upon this I should have wished to explain to the Society of Arts that, as I do not agree in considering the principles of the modern and recent British legislation of Indian land revenue as either impolitic, oppressive, or unjust, I had come to the conclusion (expressed in full detail in the paper referred to) that, upon the most mature consideration, it appeared to me that the extension of too wide a generalisation of a redemption of the land-tax would be wrong, but that, if the field of its operation were distinctly restricted to Bengal alone, or rather to those portions of the Bengal Presidency where the permanent settlement is an existing institution, and cannot be reversed without such a breach of faith as we refuse, as Englishmen, even to entertain, there would in such case be no valid objection to a land-tax redemption being effectually carried out in that part of the country.

I was glad to hear, from the observations made by Mr. Hyde Clarke, that he was distinctly under the impression, from local and personal knowledge of Bengal, or English purchaser of land found no incidence of the land-tax. This is a

further reason in support of the entire practicability and utility of a measure of land-tax redemption, upon the British model, being extended to Bengal.

I am indisposed to agree in the advisability of any scheme which, at the present time, would radically alter the existing relations between the British Government and the rental of land in India. A permanent settlement is virtually essential in any plan of land-tax redemption; and to extend such a settlement further than was accomplished by the Cornwallis legislation of 1793, would be an injudicious renunciation of all power on the part of the State, as chief landlord, to derive advantage from the growing wealth of the country. The British Government has in India largely bettered the condition of the payers of land-tax, not only in the liberal relations of assessment, but also in the exemption of improvements from the immediate incidence of the impact. And it is not called upon to make further sacrifices without full compensation in the shape of a property and income tax—a tax which is directly consistent with the principles and practice of the ancient Hindoo and Mahomedan laws, but which has recently been entirely disregarded in British India.

I also wished to have observed that in the figure of comparative taxation in India and in Great Britain (which Mr. Hyde Clarke referred to as having been submitted by me to the Statistical Society), viz., one shilling per head of the Indian population against fifty shillings per head of the British population, I did not attempt any analysis of the extremely complicated question whether, on the average, this comparatively low rate of taxation is, or is not, easier borne in India than in England? The statistical information regarding the different countries of India and the social and physical condition of its people and soil, is not sufficiently complete to warrant a very decided induction in answer to such a question.

My object in referring to this comparison was to present, for the consideration of the Statistical Society, a correction (on grounds which I fully explained) of the Parliamentary statistics of the incidence or pressure of taxation, which were recently published, and represented the ratio of proportionate taxation per head, in parts of India, by figures which, compared with those of the United Kingdom, would be as about nine or ten to one.

Without entering upon the general question, I must, however, request permission to observe that I do not agree with Mr. Hyde Clarke in the proposition that because the common labourer earns (as he states) only two shillings, or one rupee, a month, it necessarily followed that the taxation upon him is severely felt. There are mitigating circumstances of which he has the advantage, viz., the low price of the necessities of life, the absence of any oppressive fiscal exaction under British rule, and the bounty of the Almighty in giving him the great benefit of independence in respect of lodging, clothing, and fuel, the provision of all of which is so daily and pressing a care upon the European.

I am disposed also to question if two shillings per month is the normal rate of remuneration for unskilled labour in India. In the returns made to the House of Lords in 1853, it was shown that the hire of Coolies and common labourers in many localities was three rupees, or six shillings per month, without provisions, or one rupee, say two shillings per month, with daily allowance of food, and with clothing when required.

The rate of labour-hire does not include the whole question. What is most wanting in India is the example of active industry in the promotion of works of public and private utility, and the continuous employment of labour in a manner beneficial to its people and to ourselves. Any preservation of the dead level of the existing state of things is sincerely to be deprecated. It admits of statistical proof that the exhaustion of resources in unproductive ways has for ages upon ages been the bane of India. And it is indubitably within the

power and the means of British administration to show that this can be reversed; and that a country which, with all the material of wealth, is, generally speaking, eminently poor, can be made rich in every sense of the word.

The wonderfully slow general advance, either in prices or in rates of labour, which has occurred in India during the last three centuries, affords some ground for anticipating that any rapid or large advance in these important respects throughout the length and breadth of India is not to be expected. The demand for labour falls on so immense a surface (837,000 square miles), and on so vast a population (182,000,000 of souls), that it is easily and temporarily affected in particular localities without modifying the terms of the general market price.

With due deference to Mr. Hyde Clarke's judgment in this particular, I am hardly inclined to think that the increase in wages is in all respects so desirable to look forward to. If wages are too elevated, the cultivation of cotton and other raw products, to be exported in competition with America and other countries, would soon break down. It appears to me that it would be more desirable to look forward, in the first instance, in India, to a further lowering of the price of food, and of all the necessaries and luxuries of life which a native population is suited to enjoy, and, at the same time, to carrying on the construction and improvement of the great channels and means of land and water transit, so as to mobilize labour and food, to bring out the capabilities of the people and country, and to prevent (as far as is consistent with human foresight) those famines which have hitherto decimated the people of India in almost periodical cycles of time.

In conclusion, I beg to express the extreme gratification I had in listening to the able, lucid, and most interesting arguments contained in Mr. Hyde Clarke's important and practical paper, and which, I am sure, will do credit to the transactions of the Society of Arts.

I am, &c.,

FREDERICK HENDRIKS.

Kildare-terrace, W., 26th May, 1868.

Proceedings of Institutions.

GREAT WESTERN RAILWAY LITERARY SOCIETY (London).—The annual meeting of the members was held in the Reading-room, Paddington Terminus, on Monday, 26th April. The secretary's report was highly satisfactory, showing a continued increase in the number of members. The library circulation amounted to about 10,000 volumes, being an increase of 3,000 over the preceding year. Nearly 70 per cent. of these consisted of works on philosophy, history, biography, physical science, &c. The treasurer's report showed that, after a liberal expenditure for books and all other necessary requirements of the Society, a considerable balance remained in hand. During the past year Sir Watkin Williams Wynn, Bart., has presented the Society with the sum of £60, which has been expended in the purchase of standard works. A most valuable addition to the library has been made by J. H. Bertram, Esq., who has presented the whole of "Blackwood's Magazine" from its commencement. The cordial thanks of the members were accorded to these gentlemen, to the directors of the company, and to the proprietors of the London and country press, for their valuable assistance; and the success attendant upon the efforts of the officers of the Society called forth warm expressions of the members' appreciation of their exertions.

GREENWICH.—On Tuesday evening, the 27th April, owing to the sudden indisposition of Archdeacon Robinson, of the Temple, who was announced to lecture before the members of the Society for the Diffusion of Useful

Knowledge, on the "Distinctive Character of Hebrew Poetry," Mr. W. C. Bennett accepted an invitation to take his place, the subject chosen for the occasion being "Songs and Song Writers." The lecture was highly appreciated by the audience.

SIDMOUTH.—The Annual General Meeting of the Institution was held on the 9th ult., J. G. G. Radford, Esq., in the chair. The Report congratulated the members on the approved convenience of their present premises, and the wise economy of previous years, which, aided by some liberal donations, had enabled them to meet the expenses connected with the change without incurring debt, or encroaching on the income of the year. Notwithstanding a decrease (attributable to various causes) in the number of annual subscribers, the statement of receipts and expenditure showed a balance in favour of the Institution of nearly £10 on the year. The Committee would be glad to devote some part of this surplus to the improvement of the circulating library, which they regard as the principal means of extending the benefits of the Institution to the homes of the less wealthy subscribers. In the late Mr. Henry Johnson the Institution had lost not only an early and generous friend, but a zealous and efficient treasurer. So long as there was any chance of his resuming this office the Committee were reluctant to appoint any other in his place; this duty would now devolve upon the meeting. The views taken by Mr. Johnson in Italy formed the nucleus of the collection of photographs which had recently been exhibited to the public. The Committee wished it to be generally understood that their object was not to add to the funds of the Institution, but to gratify the taste and contribute to the pleasure of all their fellow-townsmen. After the reading of the Report, the election of officers took place, and the meeting separated after passing several votes of thanks.

MEETINGS FOR THE ENSUING WEEK.

- Mon.** British Architects, 8. I. Rev. R. Burgess, "On the Egyptian Obelisks in Rome, and Monoliths as Ornaments of Great Cities." II. Mr. J. Bell, "On the Application of the Entasis to the Obelisk."
- Tues.** United Service Inst., 8½.
Royal Inst., 3. Mr. J. P. Lacaze, "On the History of Italy during the Middle Ages."
- Thurs.** Zoological, 8.
Antiquaries, 8.
Linnæan, 8.
Chemical, 8. I. Mr. Kynaston, "On the Composition and Analysis of Black Ash or Ball Soda." II. Mr. Guthrie, "On Nitrate of Amyl and its derivatives."
- Fri.** United Service Inst., 3. Mr. Montagu Gore, "On the Military Character of Sir John Moore."
- Sat.** Archaeological Inst., 4.
Royal Inst., 8½. Prof. Tyndall, "On the Mer de Glace."
Astrac, 2.
Actuaries, 3. Anniversary.
Royal Inst., 3. Dr. Lankester, "On the Vegetable Kingdom in its relations to the life of man."

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 12th May, 1868.

225. Sugar—Return.
226. Foreign Sugar—Account.
245. County Courts—Return.
262. Harbours of Refuge—Return.
263. Treasury Chest—Account.
268. Ecclesiastical Commission—Return.

Delivered on 13th May, 1868.

79. Bills—Chelsea Bridge Act Amendment.
80. Stanhope and Walsingham Rectories.
82. Election Committees Scrutiny.
Constantinople and Bassorah (Line of Telegraph) Correspondence.

Delivered on 14th May, 1868.

83. Bill—Stamp Duty on Passports.

Delivered on 15th and 17th May, 1858.

159. Bankruptcy—Returns.
 174. East India Company—Returns.
 202. (11) East India (Revenue, &c.)—Return of Amount of Government Stock in India, &c.
 203. Shipping—Returns.
 274. East India (Governor-General)—Copy of a Letter.
 31. Bills—Prescription (Ireland) (No. 3).
 84. ——— Prince Edward's Island Loan.
 95. ——— Common Law Procedure Act Amendment.
 The Engravings at Badrum—Further Papers.
 Superannuation Act—Supplemental Report of the Commissioners.

Delivered on 18th May, 1858.

- 149 (1). Metropolis Rates—Returns.
 253. East India (Press)—Returns.
 271. Cooper v. Slade—Opinions delivered by the Judges.
 72. Bills—Confirmation of Executors, &c.
 95. ——— London Corporation (as Amended by the Select Committee).
 87. Bills—Chancery Amendment (as Amended in Committee, on Re-commitment, and on Consideration of Bill as Amended).

Delivered on 19th and 20th May, 1858.

266. Exchequer—Account.
 280. Beer—Account.
 281. Income Tax—Returns.
 282. East India (Governor-General)—Returns.
 Public General Acts—Cap. 10, 11, 12, 13, 14, 15, and 16.
Delivered on 21st May, 1858.
 119. Local Acts (St. Hesketh Marsh)—Admiralty Report.
 274. War Department—Returns.
 277. Pridgen's Furnace Valve Door—Report by Mr. Murray.
 286. Guaranteed Loans (Colonies)—Returns.
 281. Colonization and Settlement (India)—1st Report from Committee.
 289. East India (Oude Proclamation)—Copy of Letters.
 59. Bills—Game Laws (Ireland).
 84. ——— Poor Removal Law Amendment.
 92. ——— Friendly Societies Act Amendment.
 92. ——— Hainault Forest (Allotment of Commons) (as amended by the Select Committee).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, May 21, 1858.]

Dated 22nd April, 1858.

880. W. Bishop, Boston, Lincolnshire—Imp. in machinery or apparatus for ticketing or labelling spools, bobbins, or reels, for adjusting the size thereof for sampling patterns, for printing labels or tickets, affixing postage or other stamps or labels, for cutting their edges, and dividing them into given quantities and sizes.
 883. J. Chatterton, 7, Devonshire-street Islington—Imp. in combining and coating insulated metal conductors for electric telegraphs.

Dated 26th April, 1858.

918. W. A. Martin, 16, Powis-street, Woolwich—An improved shoe scraper.

Dated 26th April, 1858.

948. L. Tapié, Bordeaux (France)—Imp. in ship building.

Dated 3rd May, 1858.

981. J. A. Hartmann, Mulhouse, France—Imp. in preparing and combining colours for printing cotton cloth.
 983. S. Etchells and A. Consterline, Nottingham, and S. Cattell, Radford—A reversing water tube iron to work with single blast or double blast as occasion may require, and an arrangement of water tube irons and parts connected therewith.
 985. J. Taylor, Rougell park, Streatham-hill, Surrey—Imp. in stoves and fireplaces.

Dated 4th May, 1858.

989. J. Swain, Hyde, and M. Swain, Dukinfield, Chester—Certain imp. in metallic pistons.
 991. H. L. Meall, 3, St. Matthew's-place, Hackney-road—Imp. in spring fastenings suitable to be used for dresses, brooches, and other purposes.
Dated 8th May, 1858.

993. D. Thom and G. Phillips, Pendleton, Lancashire—Imp. in apparatus for bleaching and raising oil and fat.
 996. W. Ross, Glasgow—Imp. in taps or valves.
 997. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in signal and indicating apparatus for railways. (A. com.)

999. W. S. Hollnath, 5, Anchor-terrace, Minster-road, Old Kent-road—Imp. in extracting and purifying oils and fatty matters.

1001. T. Holstead, Carlisle—Imp. in machinery for the manufacture of certain articles of confectionary, which improvements are also applicable to the manufacture of biscuits and the like, and to other articles, from plastic substances.

Dated 6th May, 1858.

1002. J. Richards, Moorgate-street—Imp. in rotary pumps.
 1005. J. S. Whitway, Bristol—An improved arrangement of apparatus for ringing bells.
 1007. W. Meap, Oldham road Tool Works, Ashton-under-Lyne—Imp. in pipe joints or couplings.
 1009. H. Ashworth, Prestwich, Lancashire—Certain imp. in machinery or apparatus for cutting hides or skins.
 1011. J. Bridgman, Humbergh—Imp. in cooling fluids, and in the application of cold.
 1013. W. E. Newton, 64, Chancery-lane—Imp. in the manufacture of saltpetre. (A. com.)
 1015. J. Wright, 10, Alfred-place, Newington Causeway, Southwark—Imp. in treating madder for printing and dyeing, and in the substances and processes used in printing and dyeing with the same. (A. com.)
 1017. W. Willis, W. Langford, and J. Sheeh, Nottingham—Imp. in pressure gauges.

Dated 7th May, 1858.

1019. C. J. Carr, Westworth, Yorkshire—Imp. in forges and other hammers.
 1021. E. Openshaw, Firwood, near Bolton-le-Moors, Lancashire—Imp. in machinery for plating down or folding and securing fabrics.
 1023. J. M. Duval, Lac sur Mer, Calvados, France—An improved bed-room vase.
 1025. A. Neilson, Glasgow—Imp. in the manufacture of hats, shoes, and other coverings for the feet.
 1027. G. B. Cogan, 108, Friar-gate, Derby—A new portable apparatus to be called a stereoscope, for exhibiting stereoscopic pictures.
 1029. E. Best, Birmingham—An imp. or imp. in illumination.
 1031. D. Stothard, Lambeth, J. Jones, Southwark, and D. Jones and B. W. Jones, Spitalfields—An improved ship's mast.

WEEKLY LIST OF PATENTS SEALED.

May 21st.

2922. W. A. Cooper.
 2929. S. Riley.
 2930. C. Barlow.
 2934. D. Hallett.
 2939. W. Bearby.
 2940. C. Senda.
 2944. F. M. Mahony.
 2958. S. B. Wright and H. T. Green.
 2970. J. Nichols.
 2976. D. K. Clark.
 2982. J. Young.
 3018. W. Mercer, W. Bodden, and W. Higginson.
 3032. G. Holcroft and G. Deaholm.
 3132. G. T. Bensfield.
 3169. G. W. Hart.
 3178. J. T. Griffiths.
 3184. J. Blake and E. D. Kay.
 158. W. T. Fox.
 260. G. W. Burton.
 362. J. Henderson.
 372. A. Applegath.

404. W. E. Newton.

*478. F. C. Warlich.
 518. A. V. Newton.
 560. A. V. Newton.*

May 26th.

2954. J. Ruxton and J. T. Prosser.
 2955. J. Higham and G. D. B. Inmy.
 2961. A. Vandeleur.
 2994. A. A. Champot.
 2971. H. Descon.
 2976. R. A. Brooman.
 3001. E. Slack.
 3005. J. Buchanan.
 3023. W. Galloway and J. Galloway.
 3191. A. V. Newton.
 183. J. Haste.
 367. W. E. Newton.
 546. W. Ward.
 606. W. E. Wiley.
 645. W. A. Gilbee.
 687. W. A. Gilbee.
 678. B. Weed.

PATENTS ON WHICH THE STAMP DUTY OF 25s HAS BEEN PAID.

May 18th.

1139. I. J. Silbermann, junr.
 1153. G. Collier.
 1167. J. J. Meyer.

May 19th.

1127. W. H. Tucker.
 1161. D. L. Davis.
 1224. J. B. Ashkin.

May 20th.

1126. R. J. Stainton and E. C. Davey.
 1131. P. F. Didot.
 1140. A. F. Coome.

1147. J. Shanks.
 1146. J. H. Johnson.

- May 21st.*
 1315. J. B. Nettleship, E. J. Nettleship, and J. H. Nettleship.

May 22nd.

1154. J. Morgan.
 1167. J. A. Longridge.
 1170. J. Park.
 1186. J. H. Poulton.
 1195. W. S. Young.
 1199. C. W. Harrison.
 1454. A. E. L. Bellard.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Title.	Proprietor's Name.	Address.
4899	manten Trunk or Box	H. McCann	378, Easton-road.
4900	Well Pump	T. G. Messenger	Loughborough.
4901	Mixture in Parve Bath	J. Ozley	Camden-town.

Journal of the Society of Arts.

FRIDAY, JUNE 4, 1858.

MEETING OF COUNCIL.

The following Institution has been taken into Union since the last announcement :—

Clerkenwell Working Men's Institute.

SEVENTH ANNUAL CONFERENCE.

The Institutions in Union are requested to take notice that the Seventh Annual Conference between the Representatives of the Institutions in Union and the Council, will be held on Thursday, the 24th of June, at 10 o'clock in the morning. C. Wentworth Dilke, Esq., Chairman of the Council, will preside. Institutions are requested to forward, as soon as possible, to the secretary of the Society of Arts, the name of the representative appointed to attend the Conference.

The Chairman of, or Representatives from, the several Local Boards of Examiners, are invited to attend the Conference, as matters connected with the arrangements for the next year's Examinations will, amongst other subjects, be brought under consideration.

ANNUAL DINNER.

The One hundred and fourth Anniversary Dinner of the Society will take place at St. James's Hall, Piccadilly, on Thursday, the 24th instant, at half past five for six o'clock punctually.

EXAMINATIONS.

On Saturday last, the Examinations for this year were concluded. The total number of examination papers sent to various parts of the country was 767. These papers were worked under the superintendence of thirty-nine Local Boards. Returns have been received from every Board, and are at present in the hands of the Society's Examiners. When the judgment of the Society's Examiners has been submitted to the Council, the result, as far as the award of the prizes and certificates is concerned, will be immediately communicated to each candidate, and to the secretaries of the Local Boards.

WRITING CASE.

The Council regret that, after a careful examination by the Committee specially appointed to report on the merits of the sixty-two writing

cases sent in to compete for the Special Prize of Twenty Pounds and the Society's Silver Medal, there are none which show sufficient merit to justify the Council in awarding the Prize. The Council have decided to invite further competition, and will shortly be prepared to announce the conditions.

ARTISTIC COPYRIGHT.

The following Petition from the Society of Arts is about to be placed in the hands of Lord Lyndhurst for presentation to the House of Lords :—

TO THE RIGHT HONOURABLE THE LORDS SPIRITUAL AND TEMPORAL OF THE UNITED KINGDOM OF GREAT BRITAIN AND IRELAND IN PARLIAMENT ASSEMBLED.

The humble Petition of the Society for the Encouragement of Arts, Manufactures, and Commerce, incorporated by Royal Charter,

SHEWETH,—That in consequence of the defective state of the laws of Artistic Copyright, the Council of the above-named Society, in December last, appointed a Committee for the purpose of inquiring into the state of the Law respecting Copyright in works of the Fine Arts.

That that Committee was composed of the most distinguished Painters, Sculptors, Architects, Engravers, Photographers, Publishers, purchasers of works of Art, and several Barristers and Solicitors.

That that Committee has held many meetings, all of which were numerously attended; and, on the 24th day of March last, presented a Report, in which are pointed out the defects in the existing laws affecting Copyright in works of Fine Art, as well as such remedies as appear to the Committee best calculated to amend the same.

Your Petitioners therefore humbly pray that it may please your Right Honourable House to consider the grievances in question, and to afford such relief as to your Right Honourable House shall seem just and advisable.

And your Petitioners will ever pray, &c.

Sealed with the Corporate Seal of the Society for the Encouragement of Arts, Manufactures, and Commerce, this twenty-ninth day of May, 1858.

(Signed)

C. WENTWORTH DILKE,

Chairman of the Council.

P. LE NEVE FOSTER, Secretary.

In addition to the above, the following Petition, signed by members of the Artistic Copyright Committee of the Society, as well as by a large number of gentlemen interested in the production of works of Fine Art, will also be presented by Lord Lyndhurst :—

TO THE RIGHT HONOURABLE THE LORDS SPIRITUAL AND TEMPORAL OF THE UNITED KINGDOM OF GREAT BRITAIN AND IRELAND IN PARLIAMENT ASSEMBLED.

The humble Petition of the undersigned Painters, Sculptors, Architects, Engravers, Photographers, Publishers, and other persons interested in the production of works of Fine Art,

SHEWETH,—That in consequence of the defective state of the laws of Artistic Copyright, the Council for the Society for the Encouragement of Arts, Manufactures, and Commerce, by their minute of the 2nd December, 1857, appointed a Committee for the

Delivered on 15th and 17th May, 1858.

189. Bankruptcy—Returns.
272. East India Company—Return.
201. (11) East India (Revenues, &c.)—Return of Amount of Government Stock in India, &c.
260. Shipping—Returns.
278. East India (Governor-General)—Copy of a Letter.
81. Bills—Prescription (Ireland) (No. 2).
84. ——— Prince Edward's Island Loan.
85. ——— Common Law Procedure Act Amendment.
The Excavations at Budrum—Further Papers.
Superannuation Act—Supplemental Report of the Commissioners.

Delivered on 18th May, 1858.

- 149 (1). Metropolis Rates—Return.
253. East India (Press)—Return.
271. Cooper v. Slade—Opinions delivered by the Judges.
72. Bills—Confirmation of Executors, &c.
86. ——— London Corporation (as Amended by the Select Committee).
87. Bills—Chancery Amendment (as Amended in Committee, on Re-commitment, and on Consideration of Bill as Amended).

Delivered on 19th and 20th May, 1858.

265. Exchequer—Account.
280. Beer—Account.
281. Income Tax—Return.
282. East India (Governor-General)—Return.
Public General Acts—Cap. 10, 11, 12, 13, 14, 15, and 16.
Delivered on 21st May, 1858.
118. Local Acts (35. Hesketh Marsh)—Admiralty Report.
274. War Department—Returns.
277. Prideaux Furnace Valve Door—Report by Mr. Murray.
286. Guaranteed Loans (Colonies)—Return.
261. Colonization and Settlement (India)—1st Report from Committee.
289. East India (Oude Proclamation)—Copy of Letters.
90. Bills—Game Laws (Ireland).
91. ——— Poor Removal Law Amendment.
92. ——— Friendly Societies Act Amendment.
93. ——— Hainsault Forest (Allotment of Commons) (as amended by the Select Committee).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, May 21, 1858.]

Dated 22nd April, 1858.

880. W. Bishop, Boston, Lincolnshire—Imp. in machinery or apparatus for ticketing or labelling spools, bobbins, &c., for adjusting the size thereof for sampling patterns, printing labels or tickets, affixing postage or other stamps, labels, for cutting their edges, and dividing them into quantities and sizes.
883. J. Chatterton, 7, Devonshire-street Islington—Imp. in combining and coating insulated metal conductors for telegraphs.

Dated 26th April, 1858.

918. W. A. Martin, 16, Powis-street, Woolwich—An imp. shoe scraper.

Dated 28th April, 1858.

948. L. Tapié, Bordeaux (France)—Imp. in ship building.

Dated 3rd May, 1858.

981. J. A. Hartmann, Mulhouse, France—Imp. in combining colours for printing cotton goods.
983. S. Etchells and A. Consterdine, Nottingham and Radford—A reversing water tube iron for blast or double blast as occasion may require, arrangement of water tube irons and pipes connected with.
985. J. Taylor, Roupell park, Streatham-hill—Imp. in stoves and fireplaces.

Dated 4th May, 1858.

989. J. Swain, Hyde, and M. Swain, Dukinfield—Imp. in metallic pistons.
991. H. L. Meall, 2, St. Matthew's-place, Huddersfield—Imp. in spring fastenings suitable to be used in iron and other purposes.

Dated 8th May, 1858.

993. D. Thom and G. Phillips, Pendleton, Lancashire—Imp. in apparatus for bleaching and raising all kinds of goods.
995. W. Ross, Glasgow—Imp. in tape or cord.
997. J. H. Johnson, 47, Lincoln's-inn-square—Imp. in indicating apparatus for railways.

998. W. A. Martin, 16, Powis-street, Woolwich—An imp. shoe scraper.

1001. T. Tapié, Bordeaux (France)—Imp. in ship building.

1003. J. A. Hartmann, Mulhouse, France—Imp. in combining colours for printing cotton goods.

1005. J. Etchells and A. Consterdine, Nottingham and Radford—A reversing water tube iron for blast or double blast as occasion may require, arrangement of water tube irons and pipes connected with.

1007. J. Taylor, Roupell park, Streatham-hill—Imp. in stoves and fireplaces.

1009. J. Swain, Hyde, and M. Swain, Dukinfield—Imp. in metallic pistons.

1011. W. Ross, Glasgow—Imp. in tape or cord.

1013. J. H. Johnson, 47, Lincoln's-inn-square—Imp. in indicating apparatus for railways.

1015. J. A. Hartmann, Mulhouse, France—Imp. in combining colours for printing cotton goods.

1017. J. Etchells and A. Consterdine, Nottingham and Radford—A reversing water tube iron for blast or double blast as occasion may require, arrangement of water tube irons and pipes connected with.

1019. J. Taylor, Roupell park, Streatham-hill—Imp. in stoves and fireplaces.

1021. J. Swain, Hyde, and M. Swain, Dukinfield—Imp. in metallic pistons.

1023. W. Ross, Glasgow—Imp. in tape or cord.

1025. J. H. Johnson, 47, Lincoln's-inn-square—Imp. in indicating apparatus for railways.

WEEKLY LIST.

No. in the Register.	Date of Registration.	Particulars.
4090	May 21.	Portmanteau.
4091	" 22.	Deep well.
4092	" 25.	The M.

MENTS

FIFTH AND SIXTH

he Institutions re-
notice that the Sum-
mer the Representa-
tion and the Comm-
the 24th of June, at
C. Wentworth and
Council, will prom-
ise to forward, as
bury of the Socie-
representative appoin-
ment.


LAST

The members
of the Senate
Hall, Boston:
at 1000 p.m.

Results

100

11



Abstract

10

10

Abstract

of 10 square feet will evaporate fully 1 lb. water per minute, with a difference of temperature of 30° ; with a less difference a proportionately larger surface will be required. The latent heat of other liquids being less than that of water, a less surface will suffice for their evaporation. For instance, the latent heat of ether at, say 24° , is to that of steam at 212° as 200 to 1000, nearly, therefore only one-fifth of the surface, or one-fifth of the difference of temperature, will suffice for the evaporation of ether. The same rule will apply to the condensing vessel; but as no loss except of space can accrue from having the vessels much larger than is by calculation necessary, it will be well to make them of ample capacity and surface.

The method of ascertaining the dimensions of a pump to withdraw and compress a given quantity of vapour in a given time and at given temperatures, and of the power required to work such pump (in addition to the loss accruing from friction and the power required to overcome the weight of the valves, &c.), may be illustrated by the following calculations for another evaporating apparatus:—It has been ascertained by experiment that 100 cubic inches of air weigh 31 grains, so that one pound of air occupies 22,580·6 cubic inches. The vapour of ether at 96° is of specific gravity 2·56, so that one pound of it occupies 8,820·55 cubic inches. The force or tension of ether vapour at (say) 24°, is equal to 4·8 inches of mercury, and as the specific gravity is proportional to the tension, one pound of vapour will occupy 55,125 cubic inches. But a condensation takes place on account of the lowness of the temperature amounting to $\frac{1}{10}$ of the volume at 32° for each degree. Corrected by this amount, one pound of ether vapour at 24° occupies 47,935 cubic inches. To withdraw and condense this quantity per minute, a pump of, say, 500 cubic inches capacity, making 48 strokes, would be required. The power required to work such a pump is the difference of tension between the vapour at the temperature of evaporation and its tension at the temperature of condensation; thus, the tension of ether vapour at, say, 24°, being equivalent to 4·8 inches of mercury, and its tension at, say, 74° being equivalent to 16·1 inches, the power required to raise vapour at the former and condense it at the latter temperature will require to be sufficient to overcome a tension equal to 11·3 inches of mercury. As, however, the vapour of ether under a pressure of 16·1 inches occupies only $\cdot 32$ of its volume at 24°, the full power will not be required until the vapour has acquired the full density, and only one-half of the power will be required to reduce the volume of vapour at 24° to its volume at 74°. The power therefore required to raise one pound of ether at 24° and condense it at 74° is equal to the compression of 15,520 cubic inches (the bulk of the vapour at 74°),

$$+ \frac{47935 - 15520}{2} = 81,792\cdot5 \text{ cubic inches, with a weight of } 11\cdot3 \text{ inches of mercury, or about } 5\cdot7 \text{ lbs. per square inch.}$$

It is impossible, without the aid of drawings, to give a more detailed description of the invention. The inventor does not, however, confine himself to the use of the special arrangements of apparatus described in his patent, but he claims in his invention the use of volatile liquids (including water) evaporated in vacuo, and reduced to the liquid form in a separate vessel by pressure, for the production of cold and in the manufacture of ice, and, generally, in all processes where refrigeration is requisite or desirable. An apparatus, driven by a steam-engine of 10 horse-power, has been erected, and successful experiments were publicly made in the working of the invention, previous to the exportation of this apparatus to Australia. The question to be solved is not whether ice can be made by the machine,—of that there is no doubt whatever,—but at what cost. Experience alone will determine this.

of the evaporating vessel, he says, "a certain fact, that a surface

of inquiring into the subject of Copyright in works of the Fine Arts.

That by the Report of such Committee as made to the Council, it appears that at their first meeting the Committee appointed Sir Charles Eastlake, President of the Royal Academy, their Chairman, John Lewis, Esq., (late President of the Society of Painters in Water Colours,) Deputy Chairman, and Robertson Blaine, Esq., Barrister-at-law, Reporter.

That in addition to those gentlemen the Committee was composed of about sixty others, including Painters, Sculptors, Architects, Engravers, Photographers, Publishers, purchasers of works of Art, and several Barristers and Solicitors.

That prior to making their Report the Committee held ten meetings, which, upon all occasions, were numerously attended.

At one of such meetings the following resolutions were passed:—

"I. That the existing laws of British Artistic Copyright are exceedingly defective and unjust. The chief defects are—

1. That they afford the producers of works of Art no sufficient protection against the piracy of their productions.
2. That the purchasers of such productions are equally unprotected, and their property therein liable to invasion and injury.
3. That in consequence of this defective state of our laws of Artistic Copyright, direct encouragement is given to the extensive manufacture which is carried on of spurious copies of works of Art, which copies are extensively sold as originals, to the serious injury of the fame of the authors of such original works, the pecuniary loss of the purchasers of the spurious copies, and the demoralization of the young or needy artists employed to manufacture such copies.
4. That our Artistic Copyright laws are unjust in their operation upon the subjects of those foreign states who have entered into International Copyright Conventions with Her Majesty, inasmuch as such treaties are based upon the principle of reciprocity, and that while under those treaties the works of British Artists first published in the British dominions are protected from piracy within the territory of the foreign State named in any such treaty, no similar protection is afforded in the British territories in respect of the works by artists of such foreign States.

II. That the interests of Art and Artists, as well as of the public, require that the laws of British Artistic Copyright should be amended."

And by their Report the Committee also suggested such remedies as appeared to them best calculated to amend the defects of the existing Copyright laws.

May it therefore please your Honourable House to consider the grievances in question, and to afford such relief in the premises as to your Lordships shall seem most just and advisable.

And your Petitioners will ever pray, &c.

This Petition will remain at the Society's House till 4 o'clock to-morrow (Saturday), to receive the signatures of members of the Society and others interested in the subject.

THE MULREADY DRAWINGS

The Council having decided
Mulready Drawings to the

* See present Vol. of

is the correspondence which took place between the Council of the Society and the Trustees of the National Gallery:—

I.

Society of Arts, Manufacturers, and Commerce,
Adelphi, W.C., 19th Feb., 1858.

SIR,—I am directed by the Council of this Society to request that you will be good enough to bring before the Trustees of the National Gallery the desire of the Council to present to them three Drawings by Mr. Mulready, R.A., studies from the life, two in chalk, and one by the pen.

Some few years since the Society of Arts proposed to assist in the formation of a National Gallery of British Art, and to raise funds for that purpose by holding annually an Exhibition of the works of some one eminent living artist.

In 1848 the works of Mr. Mulready were exhibited by the Society, but the surplus funds, after payment of the expenses, did not amount to a sum sufficient for the purchase of a picture by Mr. Mulready, as had been intended in the first instance.

Mr. Mulready, however, has with great liberality presented to the Council the three Drawings in question, return for the surplus which was handed to him, a sum totally inadequate as representing the value of the Drawings, which the Council believe are well worthy of acceptance of the National Gallery as studies which have been rarely equally in ancient or modern times.

The Council have much pleasure in offering them the acceptance of the Trustees upon the following conditions, viz:—

"That when they are not publicly exhibited in London, they may be lent by the Trustees to Local Societies of Art for limited periods, for the purposes of instruction under such restrictions as the Trustees may consider necessary."

The Drawings may be inspected at the Society's House any day after the end of this week.

I have the honour to be, Sir,

Your obedient servant,

(Signed) ● P. LE NEVE FOSTER
Secretary.

Sir Charles Eastlake, P.R.A., 7, Fitzroy-square.

II.

National Gallery, 2nd March 1858

SIR,—In reply to your letter of the 19th ult., regarding the conditional presentation to the National Gallery of three Drawings by Mr. Mulready, R.A., I have been instructed by the Trustees to state that they receive the liberality of the Society of Arts, and would gladly accept the donation offered; but they do not deem it be consistent with the duties which they have undertaken to consent to have their trust qualified by the conditions proposed.

I have the honour to be, Sir,

Your very obedient servant,

(Signed) R. N. WOODS
Secretary.

P. Le Neve Foster, Esq., Secretary, Society of Arts.

III.

Society of Arts, Manufacturers, and Commerce

Adelphi, W.C., March 11th, 1858.

Council of this Society have had under consideration your letter of the 2nd inst., in which the Trustees of the National Gallery request the loan of the three Drawings by Mr. Mulready, R.A., but cannot consent to have them placed in the hands of the Trustees of the National Gallery under the conditions proposed in my letter of the 19th ult.

I am to say that the Trustees of the National Gallery have decided to accept of the three Drawings.

that is, it is not necessary to know it will increase a very small amount.

By the order of the Council of the Society of Arts, I have the honor to certify that the above is a true and correct copy of the original as submitted with the papers of the late Mr. J. N. Wornum, at Edinburgh House, 10, New Street, London.

I have the honor to be, Sir, your obedient servant.

Witness my hand and seal this 4th day of May, 1858.
J. N. WORNUM, Esq., Secretary.
The Council of the Society of Arts, 10, New Street, London.

THE METHOD.

A pump was used at some time since by Mr. Harrison, of Bristol, for the purpose of use, or rather, following the idea of the patent, for producing cold by the evaporation of volatile liquids in vacuo, the condensation of the vapour by pressure, and the continued re-evaporation and re-condensation of the same materials.

The invention consists in producing cold by the evaporation of a liquid in one vessel, the withdrawal of the vapour, and the getting rid of the heat thus withdrawn by the condensation of the vapour in another vessel, the condensation being effected by pressure, and the heat being removed by the condensed liquid being allowed to evaporate; the whole process being conducted in such a manner that is to say, the liquid and vapour being induced to rise by the pressure of the atmosphere. The operating vessel may be of tinned copper, or any air-tight and water-tight material of good heat-conducting properties capable of resisting the atmospheric pressure, and acted upon by the substances in contact with it, and of any shape, provided there be a sufficient surface of contact respectively to the liquid to be evaporated and the substance to be cooled. In like manner the condensing vessel may be of any material and shape, the requisites of strength, conduction of heat, resistance to chemical action, and sufficient surface, being attended to.

The apparatus by which the vapour is to be withdrawn from one vessel and forced into the other may consist of double-acting air pump, a double-acting pump with a piston of a half drum or gasometer shape working freely in an annular space filled with mercury; a blowing fan closed in an air-tight vessel, or a series of blowing fans; or the vapour may be forced under a head of mercury, and delivered on the other side of a partition, where the mercury is kept at a lower level by the increased tension of the compressed vapour, by means of a wing ball, a reversed archimedean screw, that is to say, a screw in which the spiral turns in the opposite direction to that in which it would raise water, so that it goes in and carries down the vapour and delivers it behind the partition; or by a reversed overshot wheel; or generally the vapour may be depressed by reversing any of the ordinary means whereby liquids are raised.

As this invention is applicable to the production of various degrees of cold by the evaporation of any volatile liquid, it is impossible to specify the dimensions of the various parts of the apparatus suitable for the endless conditions under which it may be worked. I supply the following data for the calculations as a guide to persons conversant with the principles of heat, and the properties of the substances.

of 10 square feet will evaporate fully 1 lb. water per minute, with a difference of temperature of 21° , with a less difference a proportionately larger surface will be required. The latent heat of other liquids being less than that of water, a less surface will suffice for their evaporation. For instance, the latent heat of ether at 21° is to that of steam at 212° as 200 to 1000, nearly three times only one-fifth of the surface, or one-fifth of the difference of temperature, will suffice for the evaporation of ether. The same rule will apply to the condensing vessel; but as no loss except of space can arise from having the vessels much larger than is by calculation necessary, it will be well to make them of ample capacity and surface.

The method of ascertaining the dimensions of a pump to withdraw and compress a given quantity of vapour in a given time and at given temperatures, and of the power required to work such pump (in addition to the loss occurring from friction and the power required to overcome the weight of the valves, &c.) may be illustrated by the following calculations for another evaporating apparatus.—It has been ascertained by experiment that 100 cubic inches of air weigh 31 grains, so that one pound of air occupies 22,580 cubic inches. The vapour of ether at 96° is of specific gravity 2.00, so that one pound of it occupies 4,516 cubic inches. The force of tension of ether vapour at (say) 21° , is equal to 4.8 inches of mercury, and as the specific gravity is proportional to the tension, one pound of vapour will occupy 22,580 cubic inches. But a condensation takes place on account of the lowness of the temperature amounting to $\frac{1}{10}$ of the volume at 32° for each degree. Corrected by this amount, one pound of ether vapour at 21° occupies 17,030 cubic inches. To withdraw and condense this quantity per minute, a pump of, say, 300 cubic inches capacity, making 48 strokes, would be required. The power required to work such a pump is the difference of tension between the vapour at the temperature of evaporation and its tension at the temperature of condensation; thus, the tension of ether vapour at, say, 21° , being equivalent to 4.8 inches of mercury, and its tension at, say, 74° being equivalent to 16.1 inches, the power required to raise vapour at the former and condense it at the latter temperature will require to be sufficient to overcome a tension equal to 11.3 inches of mercury. As, however, the vapour of ether under a pressure of 16.1 inches occupies only $\frac{1}{10}$ of its volume at 24° , the full power will not be required until the vapour has acquired the full density, and only one-half of the power will be required to reduce the volume of vapour at 24° to its volume at 74° . The power therefore required to raise one pound of ether at 21° and condense it at 74° is equal to the compression of 15,520 cubic inches (the bulk of the vapour at 74°).

$$+ \frac{47035 - 15520}{2} = 15757.5 \text{ cubic inches, with a weight of } 11.8 \text{ inches of mercury, or about } 6.7 \text{ lbs. per square inch.}$$

It is impossible, without the aid of drawings, to give a more detailed description of the invention. The inventor does not, however, confine himself to the use of the special arrangements of apparatus described in his patent, but he claims in his invention the use of volatile liquids (including water) evaporated in vacuo, and reduced to the liquid form in a separate vessel by pressure, for the production of cold and in the manufacture of ice, and, generally, in all processes where refrigeration is requisite or desirable. An apparatus, driven by a steam-engine of 10 horse-power, has been erected, and successful experiments were publicly made in the working of the invention, previous to the exportation of this apparatus to Australia. The question to be solved is not whether it can be made by the machine,—of that there is no doubt whatever,—but at what cost. Experience alone will determine this.

the surface of the evaporator, and from the ascertained

MUSIC PRINTING.

A patent was obtained a few months since, by Mr. Scheurmann, the music publisher in Newgate-street, for a new method of printing music, invented by him. The invention is calculated to have an important bearing in the production of printed music.

It is well-known that the present comparative cheapness of musical publications has been caused by the adoption of type-printing as the substitute for engraving. By this means, editions of standard works of large circulation, such as Handel's Oratorios, &c., are now sold at prices which a few years ago would have been considered impossible. But Mr. Scheurmann's invention will carry this advantage still farther. Even in the best of the present cheap publications (such as those of the Oratorios used at Exeter Hall) the immense number of separate pieces of type—in some instances between three and four thousand are employed in setting up a single page—cause a waste of time and labour, and, however carefully done, the printing has a disjointed and broken appearance. These objections are obviated by Mr. Scheurmann's mode of setting up the lines and the notes on two separate plates, the whole of one stave forming a single piece of metal, and the notes also being solid. The result, independently of the great diminution of labour, is a clearness and sharpness of appearance. The lines and notes being thus separately set up, in order to avoid the necessity of double printing a cast is taken of the notes, and into the mould thus obtained the frame containing the lines is pressed. A matrix combining the two plates is thus formed, which, after a conducting surface has been given to it, is then placed in a galvanic trough, where it receives a thin shell of copper of a few ounces weight, obtained by the electrolytic process; and the plate, being backed with lead, is ready for printing.

Mr. Scheurmann states that, on an average, only one-tenth of the number of types at present in use will be required by the new method, followed by a proportionate diminution in the cost of production, and a corresponding reduction in the present price of music. The process admits of the music being transposed to any key by simply altering the signature and raising or depressing the frame containing the lines, without the necessity of resetting a single note. Another striking consideration is the facility with which a plate of music once formed in the manner described, may be multiplied by the simple expedient of taking casts from it.

ROYAL SOCIETY OF ARTS OF JAMAICA.

The following notice has been issued by the Society of Arts of Jamaica:—

The Council of the Royal Society of Arts of Jamaica, alive to the necessity of submitting, if not with cheerfulness, at least with resignation, to the decision of the Honourable House of Assembly, that the Society, to whose principles of improvement they are collectively and individually pledged, shall not receive any Legislative pecuniary support, for the present year, deem it a duty to lay before the members of the Society, the anticipated results of their altered position, and the steps they have taken, and intend to take, while the cloud is passing.

Disavowing now, as they have always disavowed, not only the design, but the inclination, to intrude within the confines of politics, the Council will not further enter into any defence, either of their principles or their proceedings.

It is with great satisfaction that the Council announce to the members of the Society that, although they had calculated on the Legislative grant, which has been withheld, still they have not anticipated their expenditure. The result of this caution is, that while they are suddenly driven to suspend many of their most active

operations for the present, their balance-sheet, at the close of the past year, shows them free from debt. For this they have to thank the Royal bounty, the substantial patronage of distinguished individuals (both at home and abroad), the former liberality of the Honourable House of Assembly, and their own Members—negligently and indifferently, as they are compelled to say, many of this last class have acted in paying up their annual subscriptions.

The Council have no intention whatever of closing the doors of the Society; but, as they have no source of income at present, beyond that which their own subscribers are pleased to afford them, and as they are determined to maintain the honour of the Society, by maintaining its credit, they have been constrained, on economical grounds, to suspend the active operations of the Society to the following extent until further notice:—

First—The publication of the Transactions will be discontinued.

Second—There will be no Annual Exhibition for 1868.

Third—No Prizes will be offered for competition.

Fourth—The Annual Contracts with the Public Press for Advertisements, have been withdrawn.

As it is the earnest desire of the Council that the public should feel as little as possible the consequences of their straightened circumstances, the Museum will be kept open as heretofore, and the Council will be rejoiced to find that, while they are not able to purchase desirable additions, their inability to do so may be beneficially counterbalanced by private contributions, the fruits of individual enterprise.

The Council deprecate any desire to be exclusive in their proceedings. They invite now, as they always have invited, the co-operation of every class in the community, without exception. They will continue to make it their duty, as it is their inclination, to conciliate their fellow-colonists in every station in society; and they will at all times feel grateful for the honest comments of an enlightened Press.

Kingston, Jamaica, February 1868.

(Signed) Wm. Irving Wilkinson, V.P.; R. Hill, V.P.; R. A. O'Reilly, V.P.; James Watson, V.P.; Thomas Stewart, D.D.; L. Q. Bowerbank, M.D.; Charles Campbell, M.D.; John Radcliffe; John Daughtrey; John Nethersole; David Ewart; W. T. March; Alexander Barclay; Jonathan Edmondson; R. J. C. Hitchins; H. J. Kemble; J. A. Garcia del Rio, Secretary.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.

The twenty-first annual meeting of the Yorkshire Union was held at Selby, on Wednesday, the 26th ult. The annual conference of the delegates was held in the public room, under the presidency of Edward Baines, Esq., President of the Union, and commenced at eleven o'clock.

The CHAIRMAN, in opening the proceedings, congratulated the delegates on their again meeting in undiminished numbers, at the ancient town of Selby, the Mechanics' Institution of which had been connected for many years with the Yorkshire Union. The number of Institutions connected with the Union was slightly less than at their last anniversary, but the number of members was greater. Last year the number of Institutions in Union was 180—this year it was 127, representing 22,600 members, which was several hundred more than they had had at any former period. In most of the reports received, complaints were made of the effect produced by the recent depression of trade, and the diminution of members was in some instances ascribed to that cause, but, notwithstanding that depression of

trade, it was remarkable how well the number of members had been kept up. The most pleasing feature, perhaps, in the report, was the increase of the number of pupils attending the evening classes, and the increased steadiness of attendance at those classes. After speaking of the importance of providing improved buildings for the Institutions, the chairman proceeded to explain the alterations which had taken place in the Society of Arts Examinations, and remarked that, though the feelings of the Committee, as well as of the Institutions in the Yorkshire Union, were in favour of the former mode, it had been determined to give the new scheme every support, and local boards had been established in various places with that object. In conclusion, Mr. Baines said he was happy to find, from the report of their agent, who had been most laborious during the year, that the Institutions of Yorkshire were never in a better state than at present.

Mr. HOLK read the annual report. The Committee expressed their pleasure in again meeting the delegates and friends of the United Institutes, and then continued:—

"The reports furnished by the Institutions enable your Committee to supply the following details of their operations and progress for the past year:—

Number of Institutes in the Union	137
Last year, 130; ceased to exist, 7; withdrawn, 7; new Institutes joined	12
Total number of members estimated at	22,600
Reports received from Institutes	105
Number of members in 102 Institutes—Males, 18,219	
Females, 1,915	20,134
Annual Income of 89 Institutes	£11,453
Number of Volumes in the Libraries of 99 Institutes	109,176
Number of Issues of Books in 87 Institutes	281,535
Number of Issues to each Member	16
Number of Books added during the year to 88 Institutes	9,292
(Being an increase of 8·5 per cent.)	
Number of Periodicals taken in 93 Institutes:—	
Weekly	227
Monthly	548
Quarterly	68
Newspapers	843
Number of Lectures delivered at 85 Institutes	826
Of which 146 were paid, and 420 gratuitous, and they have been classified as follows:—	566
Literary	362
Scientific	163
Musical	41
	—566

In 83 Institutes, containing 17,670 members, the number of pupils belonging to classes is returned 7,422

COMPARATIVE TABLE.

	1857.	1858.	Increase.	No.	p.ct.	Decrease.	No.	p.ct.
Members in 94 Institutes	17,785	18,913	1,128	6·4				
Do. 48 do. ...	10,003	11,937	1,934	19·3				
Do. 42 do. ...	7,290	6,484	...	...	808	11·0		
Pupils in 48 do. ...	1,121	1,380	259	23·1				
Income of 84 do. ...	£10,040	£10,915	£875	8·7				
Periodicals in 79 do. Weekly..	172	192	20	11·6				
Monthly..	511	483	...	...	28	5·5		
Quarterly 68		62	...	...	7	10·1		
Newspapers	652	679	27	4·1				
Lectures at 70 (Paid	120	137	17	14·1				
Institutes... Unpaid	481	349	...	...	132	27		
Books in Libraries of 99 Institutes	99,884	109,176	9,292	9·5				
Issues in do. 70 do	262,213	282,322	110					
Pupils in classes of 59 do. ...	5,471	6,008	537	9·8				

"These figures are gratifying in an especial manner, because they show that in spite of the very great depression in trade, and consequent want of employment, the Institutes have not merely not suffered, but have made an actual average increase of six per cent. in numbers, and eight per cent. in funds. The reports from several Institutes ascribe to this depression their want of progress during the past year, but it is clear from the above figures, that the badness of trade has not operated either so greatly or generally on educational interests as might have been anticipated. In fact, a time of very good trade is quite as likely as one of very bad trade to be detrimental to the prosperity

of educational institutes. The latter may somewhat deduct from the pecuniary means of the working classes, though the very small contribution required as the subscription to these Institutes scarcely renders such a plea admissible. On the other hand, seasons of active trade stimulate the national tendency to overwork, and by protracting the hours of business beyond reasonable limits, destroy at once the opportunity and the inclination for intellectual pursuits."

There was indeed little doubt that the indirect and external influences of these societies were quite as great and beneficial as their direct effects; and if further proof were wanted of the hold which Mechanics' Institutes had gained upon the public mind, it might be found in the fact that at least twenty-five of the institutions of Yorkshire have erected buildings specially adapted for the purpose, while at several places—among others, Huddersfield, Holbeck, Selby, Mossley, Marsden, and Dewsbury—endeavours were now making to raise funds to secure the same object. The Committee heartily hoped that these efforts would be successful, and that the respective societies would receive the cordial co-operation of the friends of education in the various localities.

After some discussion in reference to one or two of the subjects especially alluded to in the report, a resolution was passed to the effect:—

"That the following gentlemen form the Central Committee of the Union for the ensuing year:—Edward Baines, Esq., Leeds, president; Henry Oxley, Esq., Leeds, treasurer; Mr. John Hope Shaw, Mr. Jas. Kitson, Mr. Thomas Wilson, Mr. W. S. Ayrton and Rev. Thomas Hincks, Leeds; Rev. J. H. Ryland, Bradford; Mr. W. Crowther, Gomersal; Mr. Wm. Marriott, Huddersfield; Mr. John Crossley, Halifax; and Mr. John Binks, Wakefield. Mr. James Hole and Mr. James Kitson, jun., honorary secretaries; Mr. Isaiah Dixon, honorary secretary and treasurer of the Village Library; and Mr. Barnett Blake agent and lecturer."

The place of meeting for 1859 was then considered, and Rotherham was fixed upon by a large majority.

The Rev. Mr. WARD, of Holbeck, moved that the thanks of the meeting be given to the Society of Arts, for the stimulus given to class instruction in the Union by the annual examinations and the awarding of prizes and certificates.—Mr. PRITCHARD, of Hunmanby, seconded the motion, which was unanimously passed.

The meeting next entered upon the consideration of various subjects for discussion.

The CHAIRMAN first invited opinions upon the question, "Shall the Union recommend the institutions to prepare pupils next year for the examinations of the Society of Arts?"

After some discussion, the following resolution was carried unanimously:—

"That this meeting is of opinion that the institutes composing this Union should prepare as many pupils as they severally can for the next year's examinations by the Society of Arts, and is not without hope that the Society will reconsider its late decision respecting the mode of examination and the amount of subscription proposed to be required of the smaller institutes."

A vote of thanks was then passed to Mr. Baines.

On the termination of the morning conference, the delegates sat down to dinner at the Londesborough Arms. Lord Londesborough presided, and was supported by Lord Goderich, M.P., Sir W. M. Milner, Bart., R. M. Milnes, Esq., M.P., P. O'Callaghan, Esq., Edward Baines, Esq., and other gentlemen. Major Waud occupied the vice-chair.

A Soirée was held in the public room, at six o'clock. Viscount Goderich, M.P., in the absence of Lord Londesborough, presided. The hall was filled, all the delegates being present, and the general company included a considerable number of ladies. On the platform were Sir W. M. Milner, Bart., Col. Smyth, M.P., R. M. Milnes, Esq., M.P., Major Waud, P. O'Callaghan, Esq., George Leeman, Esq., Edwd. Baines, Esq., Mr. Lowther, president, and Mr. Cutting, vice-president of the Selby Mechanics' Institute, &c.

The CHAIRMAN, after expressing regret at the unavoidable absence of Lord Londesborough, said he believed

that the great spread of Mechanics' Institutions throughout Yorkshire of late years, and the high position which they now occupied among the institutions of the country, had been very much owing to the efforts of the Yorkshire Union. It had now been engaged in this work for upwards of twenty years; it had done much to promote the establishment of classes, and it was owing very much, he thought, to the existence of the Yorkshire Union, and to the efforts of its able and zealous president, Mr. Baines, that they had in Yorkshire last year public examinations held by the Society of Arts. He trusted that those examinations would be continued. He understood that the Society had made some alterations in their system, which he could not view with great favour, because it appeared to him that the system in force last year worked remarkably well and had in it many advantages. But because they might not altogether agree with the views of the Society of Arts, he thought they ought not to reject their assistance in this great work, for it appeared to him that examinations of this kind were the bond and complement of the labours of the Yorkshire Union—that they brought the institutes of the county into practical competition one with the other—that they threw them into a friendly rivalry with each other, and that they enabled them to know the real value of their efforts, and to compare the results of their respective exertions. Surely a body representing, as this Union did, this great educational effort in Yorkshire, able to communicate with societies learned and famous like the Society of Arts—and he only wished that the Society of Arts would attend a little more to its representations—an association of that description was just the thing wanted to complete the system of their Mechanics' Institutions, and to render them, from the isolated efforts of single individuals, a great organic whole.

Mr. R. MOWKTON MILNER, M.P., moved a resolution in favour of Mechanics' Institutions, speaking of their present favourable position, and particularly insisting upon action being paid to the elementary branches of education.

The resolution was seconded by Major WAUD, and carried.

Mr. EDWARD BAINES then moved the following resolution:—

"That the continued progress of the Institutions comprised in the Yorkshire Union, as shown by the increase of members, and more particularly by the great extension of class instruction, affords the most satisfactory proof of the value and efficiency of the Union in promoting the successful working of these Institutions, and by the interchange of experience and systematic organisation rendering them of practical benefit to the great majority of the population: and the Union is therefore entitled to the continued and increased support of all who desire to promote the mental and moral welfare of the rising generation."

In the course of his address Mr. Baines gave various statistics, showing the present state of the Institutions in the Union, which proved it to be in a prosperous condition.

The resolution was seconded by Colonel SMYTH, and carried.

The Rev. Mr. RYLAND moved the third resolution, as follows:—

"That the examinations of the Society of Arts having proved successful in stimulating attention to the study of various useful branches of science and literature, this meeting desires to express its thanks to the Society of Arts, and its wish for the continued application of so valuable an aid to the operations of Mechanics' Institutes."

The Rev. Mr. RYLAND seconded the resolution, which was then carried.

The President then moved a vote of thanks to the Yorkshire Union, for which they had made for the

Mr. CARLILE seconded the motion, which was carried with acclamation.

Sir W. M. MILNER moved a vote thanks to the Chairman, which was seconded by Mr. LOWTHER, and carried.

Lord GODERICH acknowledged the compliment, and the meeting separated.

SOUTH KENSINGTON MUSEUM.

During the week ending 29th May, 1858, the visits have been as follows:—Morning, 10,764; Evening, 4,414; Total, 15,409.

Colonial Correspondence.

THE BOMBYX CYNTHIA.

SIR,—In a recent number received here of the Journal of your Society, there appears a copy of a despatch from the Governor of Malta, Sir William Reid, to the Secretary of State for the Colonies, on the subject of the *Bombyx Cynthia*, or Eria silkworm.* Knowing the interest that has generally been evinced in various quarters with respect to this insect, I would now beg leave to offer a few observations in the matter, with a view to publicity in the same Journal.

I am not aware whether the Eria is at present rare in any part of this island, or whether it is now altogether extinct here, although, on its first introduction from the British colony of Grenada, in 1856, it was very extensively propagated, with the aim, if possible, of the insect being turned to account in a commercial point of view. The breeding and rearing were found to be easy and successful enough, but the chief difficulty was with the cocoons, which appeared incapable of being wound. In my own management of the worms, of which at the time I possessed several hundred, I early discovered that the moth, on emerging from the cocoon, did not cut away the thread at the extremity, in order to free itself from its covering after the manner of the *Bombyx mori*. In fact, one end of the cocoon of the Eria, when the chrysalis is yet inside, will, on inspection, always be found to be open, and the silken thread nicely doubled over at that end; yet the unwinding is far from being of easy accomplishment, and although often attempted by myself, I never succeed in getting off more than a yard or so at a length without breaking. The like experience had many others, who consulted me upon the subject. Nevertheless, I entertained the opinion, which I communicated to those who sought for information, that the cocoons could be carded and spun, and thereby made available as a commercial product of some value; and which opinion, I am glad to find, is confirmed in the sixth paragraph of Sir W. Reid's despatch, where he states, that in France, as well as in Malta, the cocoons are so treated. He further remarks, that in France they have partially succeeded in unwinding the cocoon, and if it is really possible to do so readily, and in the entirety, there would no longer be a doubt of the true value of the Eria, and of its importance as a silk-producing insect. Under the conviction that, carded and spun, the cocoons would furnish a new raw material for thread and clothing, I sent to you, about the middle of last year, through A. F. Ridgway, Esq., a few thousand of the cocoons to be reported on; and this gentleman has lately informed me that you had placed them in the hands of competent persons for the purpose. Immediately I am made acquainted with the result, I shall be glad to give every publicity to it, for the information of any who may yet be rearing the insect, or inclined to do so, for the sake of profit; and I should, indeed, less rejoice if thereby a way is opened up as an

* See present Vol. of Journal, page 120.

ditional source of employment, and a means of livelihood to many of both sexes of our humbler classes, to whom he first would be an easy and agreeable task, and the second a positive boon in these impoverished days.

Before quitting this subject, I would simply remark, that the *Bombyx Cynthia* having, I believe, come from Assam, where I am led to understand the produce of the worm is used for the manufacture of some textile fabrics, is it not practicable to ascertain in what manner the cocoons are there turned to account?

I would now proceed to touch upon another matter made able in the same number of your *Journal* already referred to. I mean the value of certain samples of pineapple and plantain fibres, in your possession, from Ceylon,* and which is suggestive of a few remarks relative to the fibres of this country.

The fibre question, as it has been termed here, constituted, some time back, the absorbing question of the day among us. Now, with the apathy, indifference, or fickleness, which unfortunately characterises most popular movements in this colony, it would appear to be unthought of, or to have yielded to some other temporary mania. It is not my present intention to inquire into the causes of this. Rather is it my hope that the matter is still receiving some share of steady public attention amongst our agricultural population, and that some parties are dedicating their means and time to develop his most important branch of commercial economy, and which presents a ready and a certain source of wealth so such as choose to pursue it in a proper spirit of energy and enterprise. It is well known that fibre of numerous kinds and qualities can be produced from various plants capable of being grown in any quantity in our fertile soil. This fact is incontestable, and is proved by the varied collection kindly prepared and presented by Nathaniel Wilson, Esq., the Curator of the Botanical Gardens in St. Thomas-in-the-East, existing in the Museum of this Society, and similar specimens thereof were sent by him, through us, to the Paris Exhibition; and also by the experiments of sundry private individuals. Neither does it require much argument to demonstrate the value of our fibrous produce, in a commercial sense, since the samples which from time to time have been forwarded from this island have attracted the particular attention of competent mercantile and other judges in the British and European markets, and have been pronounced fit for various uses, and consequently of correspondent pecuniary worth. The value set upon the Ceylon fibres may be considered as corroborative evidence of the foregoing fact. If Jamaica, then, can yield as good or better fibres as can Ceylon, and prepared, too, from similar plants as those referred to, such fibre ought, surely, if properly got up, to command as high rates as those quoted for the Cingalese productions, and should afford some inducement for public attention here to be earnestly directed to this important subject. With this latter view, I have made public in our local journals the extract from your *Journal* relating to the Ceylon fibre.

A great desideratum required in this island, in the preparation of fibre for market, is a simple, economical, and efficient machine. I know that two or three ingenious individuals of our community are separately engaged at work in order to supply this want; and I trust that, ere long, the labours of one or other of them may result in complete and deserved success, and that Jamaica may, in this respect, soon triumphantly wear away the palm for inventive skill. Such a consummation would greatly tend to give an impetus to the production of fibre, and render it, probably, one of the permanently available articles of export from, as well as an additional source of wealth to, the colony.

Apologising for the length of the present communication,

I remain, &c.,

J. A. GARCIA DEL RIO,
Secretary.

Kingston, March 22, 1868.

Home Correspondence.

INDIAN SETTLEMENT.

SIR,—Mr. Hendriks' observations, in the last *Journal*, rather tend to the definition of his own views than the impugnment of mine. He admits the principle of the redemption of the land-tax or rent, under suitable circumstances, and I have advocated no more. My observations are chiefly directed to the attainment of a price for land in India, by the creation of freeholds, leaving the land rent to take the character simply of a land-tax, as in this country, or as corresponding assessments are carried out in the United States and elsewhere, leaving the holder with a full and free title, in no way dependent on the revenue system. It is difficult to see why India should be deprived of a freehold tenure.

I have not asserted that the normal rate of labour in India is a rupee per month, only that such a rate is to be found, and it is one which I consider inconsistent with the well-being of the population as consumers.

The stationary condition of the population, of prices, and of the rates of labour, during the last three centuries, assuredly is no more reason for refusing to believe in the capability of advance and improvement, than the assertions of the like facts with regard to Ireland. Whether faults may fairly be attributed to the administrators of India, the resources of the whole country are advancing to a degree far beyond anything realised in the historical period referred to, and evidences of enterprise are to be found everywhere throughout India. Although little remarked in this country, there are districts in India making a progress commensurate with that of Canada and the Western States of America, particularly in the table-lands and hill regions. The development of the resources of Assam, of late years, will bear a very fair comparison with many of our colonies and many parts of the States. Of course, old and populous parts of Bengal or Bahar are not to be subjected to such comparisons. It is dangerous to lay down, as a principle, that India is to be stationary, until we ascertain that the railways, steam-boats, roads, and postal system, and the promotion of agriculture, mining, and commerce, which have succeeded everywhere, all fail there.

With regard to the rise in prices and wages which must take place, it is difficult to affirm that India will be unable to compete with the United States in the growth of cotton, when the great obstacle to the production of cotton in India has yet to be removed by the provision of cheap and efficient means of conveyance. The occasional lowering of the price of food, in times of famine, may be looked for from improved means of conveyance, as Mr. Hendriks indicates, but a general lowering of the price of food is not to be looked for. Where food is now low, it is because there is no outlet for its sale, but every mile that it is moved to a market enhances its price, and cannot reduce it. Wherever a market has been opened for rice, for instance, within the last few years, the price has risen, and, indeed, in many districts of Bengal the price has advanced consequent upon the exports to China and Europe, and yet the whole of this export trade is but a small portion of the total produce of the country.

My paper was directed to the main subject of increasing the European element in India, and I am led, therefore, to perceive that Mr. Hendriks' objections go only to subsidiary and collateral points of my subject.

* See present Vol., page 167.

though integral portions of that on which Mr. Hendriks has bestowed great labour, and which he has subjected to a searching analysis.

I am, &c.

HYDE CLARKE.

42, Basinghall-street, May 31, 1858.

Proceedings of Institutions.

DOVER.—The Museum and Philosophical Institution held its annual general meeting on the 28th April (being its 22nd anniversary). The chair was taken by James Poulter, Esq., V.P., and the report was read by Mr. Phillips, honorary secretary. The reading-room is now supplied with six daily London newspapers, besides weekly papers and periodicals. About fifty volumes had been added to the library during the past year. The committee had made an unsuccessful attempt to obtain the grant of £15, to be given in books, maps, &c., from the "Peel Memorial Fund," three other Institutions having exhibited stronger claims. The plan of hiring a monthly supply of books from London, for the use of members, had met with entire success. There had been twelve lectures, as under:—On "The Writings of Douglas Jerrold," Mr. Applebee; an Exhibition of Italian Photographs from Rome, and a reading on them, Mr. L. Weston; the "Antiquities of Dover," Mr. Edward Knocker; "Charlotte Brontë," Mrs. Balfour; "Sir Walter Raleigh," Dr. Daniel; "Coal," Mr. Mackie; "Sleep, as described by the Poets," Rev. Peter Spencer; "Musical Entertainment, Mr. Doome; "Social History," Mr. Roberts; "Marine Natural History," Mr. J. R. Mummery; "Dissolving Views," Mr. Crow; "Fire with Experiments," Mr. Mockett. The museum had been attended during the year by between 10,000 and 11,000 persons. The Gnu or Horned Horse, from Africa, had been presented by the curator, Dr. Astley. Two Javan musical instruments, a map of Java, some Madrepores, and model of a Chinese coffin, by Mr. Millett, and some African birds, by Dr. Morgan. Since the last annual meeting, 42 members have withdrawn, and 32 joined the Society; the number now on the books is 140. An address to H.R.H. the Prince Consort, on the marriage of H.R.H. Princess Royal, to H.R.H. the Prince Frederick William of Prussia, had been signed by several of the members of the Institution and forwarded to the Society of Arts. From the treasurer's account, it appeared, that the income of the Society for the year had been £138 10s. 4d.; and the expenditure £125 16s. 3d., leaving a balance in hand of £12 14s. 1d. The election for officers and committee for the ensuing year next took place, when the Mayor was chosen president; James Poulter and George Thompson, Esqrs., vice-presidents; Mr. Phillips and Mr. Bottle, secretaries; Dr. Astley, curator; Mr. Crow, librarian; Mr. Penny, treasurer; and Mr. Bees, guardian of the apparatus. The committee were balloted for. The six retiring members were, Mr. J. Biggs, Mr. J. C. Ottaway, Mr. George Thompson, Mr. Barton, Mr. J. R. Mummery, and Mr. J. B. Hambrook. Mr. J. Biggs and Mr. Ottaway were reappointed, and in lieu of the remaining four, the following gentlemen were elected:—Dr. Morgan, Mr. W. H. Payn, Mr. W. Knocker, jun., and Mr. J. Sillwell.

REDHILL.—The last Report of the Institution records its continued progress. The number of subscribers at the present time is 170; 90 having been admitted during the year; 60 have left; leaving a net increase of 30. The number at the close of last year was 140. Two musical entertainments and sixteen lectures have been given during the year, seven gratuitous, and eleven at an expense to the Institution of nearly £32. The committee take the opportunity of specially acknowledging the kindness of those gentlemen who have so largely

contributed to the interests of the Institution by their gratuitous services and lectures. The gratuitous lectures were—1. "On the Contents of the Library," by R. C. Carrington, Esq.; 2. "The Form and Dimensions of the Earth," by R. C. Carrington, Esq.; 3. "The Mountains of Switzerland," by Dr. Headland; 4. "Travels in Russia," by W. Klein, Esq.; 5. "Clocks and Watches,—their History and Inventors," by Mr. Fowler; 6. "The great Tobacco Question," by Mr. Reynolds; 7. A Concert given by the Hungarian Brothers, for which members are indebted to the liberality of N. Wilkinson, Esq. The paid lectures were—1. Musical Entertainment and Lecture, by G. Buckland, Esq.; 2. "On the Curiosities of Insects," by J. N. Selway, Esq.; 3. "On the Honey Bee," by J. N. Selway, Esq.; 4. "On the Microscope and its Revelations," by J. N. Selway, Esq.; 5. "On the Sayings and Doings of the Anglo-Saxons," by G. Dawson, Esq.; 6. "On Sir Walter Raleigh," by Dr. Daniel; 7. "On the Romance of the Bourbons," by Dr. Daniel; 8. "On David Copperfield," by G. Grossmith, Esq.; 9. "On Thomas Hood," by W. Bowron, Esq.; 10. "On the Philosophy of Heat and Cold," by E. Wheeler, Esq.; 11. "On the Remarkable Women of the Nineteenth Century," by Mrs. Balfour. The library now contains 597 volumes, of which 127 by gift and purchase have been added during the year. The following is the number of each class of books issued during the year; Educational, 118—Biographical, 59—Poetical, 64—Historical, 44—Miscellaneous, 333—Novels, &c., 504—making the total number, 1,122; those of a light class, 504, and those of an instructive character, 618. The committee acknowledge, with best thanks, numerous donations to the library. The elementary class for writing and arithmetic, has been much better attended, and the discussion class has been recommenced. The class for instrumental music excites much interest. A class has also recently been formed for vocal practice and instruction. The best thanks of the committee are due to the Right Honourable Lord Monson, for his kindness in throwing open his grounds and mansion to the members and their friends, on the occasion of the few which was most successful.

SHERWOOD (BATTERSEA) MUTUAL IMPROVEMENT SOCIETY.—The fifth annual report, recently published, states that the library, which at the commencement of the year contained 588 volumes, now numbers 810, being an addition of 222. The number of books lent out for home reading during the year was 1600. Three volumes of great interest have been presented to the library by the president, G. F. Wilson, Esq., F.R.S., also two volumes on the "History of British India," by the author, J. M. Ludlow, Esq. During the season seventeen lectures (eleven scientific, four literary, and two musical), of a first-class character, have been delivered. To those gentlemen who have favoured the Society with gratuitous lectures, the committee beg to express their best thanks, among whom may be mentioned the Rev. J. Barlow, for his instructive lecture "On a Few Facts and their Scientific Applications." Also to Mr. Williams, for his lecture "On Music." At the commencement of last winter it was proposed that classes for the study of various subjects should be established, but unfortunately the members did not second the committee in their undertaking. The local music class, however, still meets with the support of a large number of members, whose progress in music fully testifies to the ability of the instructor. In the early part of January last the committee held an Evening Festival. A tea was provided, of which one thousand persons partook, after which Mr. Williams, assisted by a large number of his pupils, entertained the company with a selection of vocal and instrumental music.

WORKING.—In presenting the eighth annual report of the Literary, Scientific, and Mechanics' Institution, the Committee have still to regret the great fluctuations in the number of members from one quarter to another.

The number of members for the first quarter of the past year was 97, for the second 66, for the third 50, whilst the number for the fourth quarter again rose to 90. The receipts from all sources during the year have amounted to £28 7s. 11d. The ordinary expenditure has been £26 14s. 4d., leaving a balance of £1 13s. 7d. But £7 15s. 9d. has been paid during the year for apparatus, purchased in compliance with a resolution passed in 1853. At a meeting of the Committee in November, 1853, which was attended by several of the vice-presidents, £35 out of the exhibition surplus was ordered to be reserved for the purchase of philosophical apparatus—but the total sum expended for this purpose has been £15 6s. 1d., of which the before-named sum of £7 15s. 9d. forms part. Only two lectures have been given during the year. The very small number of the members who attend lectures has made the Committee reluctant to ask gentlemen to come from a distance, and has also deterred members of the Institution from devoting time and incurring expense in preparing lectures. Several entertainments have been given by strangers during the year, to which members of the Institution have been admitted at reduced charges. A concert was given in aid of the funds of the Institution, by the members of the Harmonic Society in October last, the profits of which amounted to £1 7s. 8d., although all members were admitted free. A course of lectures on natural philosophy was commenced in January, 1857, and continued during the spring months. Classes for writing and arithmetic are being carried on under the superintendence of the librarian. 1,240 volumes of books have been taken out to read during the year, exclusive of the unbound periodicals. The Committee have attempted to carry out a suggestion made at the last annual meeting, viz., to supply the villages in the neighbourhood with books for circulation at a low rate of membership. Ridgmount has been selected for the first experiment; the subscription has been fixed at one shilling per quarter, and the number of books allowed at a time is in proportion to the number of members. The books are exchanged as often as required. It will be one of the duties of the new committee to decide whether any attempt shall be made to carry the experiment further.

MEETINGS FOR THE ENSUING WEEK.

- Mon. Royal Inst., 2. General Monthly Meeting.
Entomological, 8.
Tues. Royal Inst., 3. Mr. J. P. Lacaze, "On the History of Italy during the Middle Ages."
Syr-Egyptian, 7. Mr. J. Bonomi, "On the Description of the Serpophagus of Oesiris in the Museum of Hartwell."
Med. and Chir., 8.
Zoological, 9.
Wed. Literary Fund, 3.
Royal Soc. Lit., 4.
Geological, 8.
Archaeological, 8.
THURS. Royal Society Club, 6.
Antiquaries, 8.
Royal, 8.
F. United Service Inst., 8. Rev. G. R. Gleig, "On the Duke of Wellington's Wars in India, and the Views which he entertained of what ought to be the Military and Civil System of English Administration in that Country."
Astronomical, 8.
Royal Inst., 8. Prof. Faraday, "On Mr. Wheatstone's Electric Telegraph."
F. Royal Inst., 3. Dr. Lankaster, "On the Vegetable Kingdom in its relations to the life of man."

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

1. No. Delivered on 22nd, 27th, and 28th May, 1858.
2. Education (Consolidation of Minutes and Regulations)—Paper.
3. Cambridge Lighthouse—Return.
4. Navy (Continuous Service Men)—Return.
5. Oxford University—Copies of Regulations.

- 63 (4). Trade and Navigation Accounts (30th April, 1858).
273. London Corporation Regulation Bill—Minutes of Proceedings of the Select Committee.
279. Coals, Coke, and Calm—Account.
285. Mr. W. P. Snow—Copies of Memorials, &c.
237. Silver, &c. (China)—Return.
275. Examinations (Army)—Copies of Report and Correspondence.
288. Endowed Schools (Ireland)—Return, &c.
293. Ordnance Survey (Scotland)—Return.
83. Bills—Public Health.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, May 28, 1858.]

- Dated 22nd March, 1858.
596. A. Lester, Coventry—Imp. in weaving ribbons, fringes, trimmings, and other narrow fabrics.
Dated 9th April, 1858.
763. J. B. Blebyuck and J. Van Landuyt, Brussels—An improved process for separating the vinous and amylaceous principles from vegetable substances.
Dated 14th April, 1858.
804. M. A. F. Mennesson, 39, Rue de l'Écliquier, Paris—Imp. in obtaining motive power, and in apparatus connected therewith. (A com.)
Dated 20th April, 1858.
860. E. Derogy, 33, Quai de l'Horloge, Paris—Imp. in instruments and apparatus applicable to photographic purposes.
Dated 23rd April, 1858.
896. W. Ryder, Bolton-le-Moors, Lancashire—Imp. in preparing shrouds and moulding boxes for casting metal or other materials.
Dated 24th April, 1858.
904. A. S. Stocker, 18, Wimpole street, Cavendish-square—Imp. appertaining to articles to be affixed to boots and shoes, and to the feet of animals, and in the machinery and means employed for producing the same.
Dated 27th April, 1858.
938. D. E. Hughes, New York, U.S.—Imp. in the means of, and apparatus for, transmitting signals and electric currents.
Dated 3rd May, 1858.
987. W. Clark, 53, Chancery-lane—Imp. in separating and in otherwise treating matters in a state of fusion, and in apparatus for the same. (A com.)
Dated 4th May, 1858.
990. W. H. Morrison, Nottingham—Imp. in means or apparatus employed in the manufacture of bonnet and cap fronts, rouches, and such like articles of millinery.
Dated 5th May, 1858.
994. R. Sharp, Lowther-street, Liverpool—Imp. in pianofortes.
998. T. Preston, Nottingham—Imp. in the manufacture of cut pile fabrics, in warp machines.
1000. J. Lawson and T. Robinson, Leeds—Imp. in machinery for hackling and dressing flax, and other fibrous substances.
Dated 6th May, 1858.
1001. M. Davis, 5, Lyon's-lan—Imp. in carriage wheels, and in means of retarding their motion.
1006. J. Whitley, Leeds—Imp. in the manufacture of iron, which imp. are also applicable when obtaining other metals from their ores.
1008. E. J. Scott, Glasgow—Imp. in the manufacture of boots and shoes.
1010. T. W. Thacker, Derby—Imp. in the construction of the finger-ends of pianoforte, organ, and harmonium keys.
1012. J. Casey and J. Hughes, Spital-square—Imp. in looms for weaving velvet ribbons.
1014. W. Clark, 53, Chancery-lane—Imp. in "bits" for horses' bridles. (A com.)
1016. H. Jackson, 2, Park-street, Leeds—Imp. in machinery for dressing and cleaning flax, hemp, and other fibrous substances requiring like treatment.
Dated 7th May, 1858.
1018. J. Bunnett and J. G. Bunnett, Deptford—Imp. in steam-engines.
1020. J. Castle, Grantham—Certain imp. in breaks used for retarding the motion of carriages on ordinary roads.
1024. J. J. Field, Paddington—Imp. in evaporating or in extracting moisture from liquids, and from substances in a liquid state, and in apparatus to be employed thereon.
1026. W. E. Newton, 66, Chancery-lane—Imp. in the construction of fire-grates for furnaces, stoves, and other fire places. (A com.)
1028. C. Botten, junr., Clerkenwell, and N. F. Taylor, Stratford—Imp. in means or apparatus employed in measuring and in regulating the flow of gas and other fluids.
1030. T. Brown, Ebbw Vale, and D. Brown, Cwmbran, Monmouthshire—New or improved machinery for filing or smoothing the ends of fish-plates, rails, wrought iron railway chairs, and other articles made by sawing bars transversely.
1032. W. Clark, 53, Chancery-lane—Imp. in apparatus for sharpening saws. (A com.)
Dated 8th May, 1858.
1033. J. T. Robeson, 45, High-street, West Fimliffe—Imp. in sheet zinc and tubular boilers. (A com.)

1634. A. V. Newton, 66, Chancery-lane—Imp. in machinery for manufacturing paper. (A com.)
 1635. W. E. Newton, 66, Chancery-lane—Certain imp. in grinding circular saws. (A com.)
 1637. G. Day, St. Pancras—An improved self-acting valve for regulating the flow of liquids.

Dated 10th May, 1858.

1639. C. F. Vassero, 45, Roux-street, Strand—Imp. in the manufacture of umbrellas and parasols. (A com.)
 1641. W. H. Ogden, Liverpool—Imp. in pumps.
 1642. W. C. Forster, 9, Great Tower-street—An imp. in the manufacture of bricks and slabs for preventing damp in the walls of houses and other buildings.
 1643. I. L. Bell, Washington Chemical Works, Newcastle-upon-Tyne—Imp. in the manufacture of iron.
 1644. J. M. E. Masco, Rue des Foies St. Thomas, at Evreux (Eure), France—Imp. in diving apparatus.
 1645. R. Willan and D. Mills, Blackburn—Imp. in machinery or apparatus for drawing in, twisting, or looms textile materials.
 1646. W. G. Taylor, Ashby-de-la-Zouch, Leicestershire—Imp. in covering the rollers employed in spinning cotton and other fibrous materials.
 1647. J. B. Pico, Newington Butts, and C. Payne, Bermondsey-street, Southwark—Imp. in recovering useful matters from oil or floor cloth, tarpaulin, American leather cloth, and other like substances.

Dated 11th May, 1858.

1648. F. Apparati, Paris, Rue Constantine, 24—A machine applicable for picking and choosing out corn.
 1649. J. Luis, 18, Welbeck-street, Cavendish-square—A mechanical washing apparatus for iron ore and other matters. (A com.)
 1650. G. H. Creswell, Devonport—Imp. in pads and apparatus for inking stamps.
 1651. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in madder dyeing. (A com.)
 1652. E. Fairburn, Kirkstons Mills, Mirdale, Yorkshire—Imp. in machinery or apparatus employed in carding wool and other fibrous substances.
 1653. J. Soutter, Hoxton—Imp. in washing machines.
 1654. W. Pare, Seville Ironworks, Dublin—Imp. in metallic and other bedsteads, and other articles of furniture.
 1655. A. Parkes, Birmingham—Imp. in the manufacture of tubes and cylinders.
 1656. A. Parkes, Birmingham—Imp. in rollers or cylinders used for printing and embossing.
 1657. W. Oliver, Cradley, Worcestershire—Imp. in combining ovens for the manufacture of coke with the furnaces of steam boilers.
 1658. R. Halliwell, Bolton-le-Moors, Lancashire—Certain imp. in mules for spinning and doubling cotton and other fibrous materials.
 1659. G. Lowry, Salford—Certain imp. in machinery for heckling flax and other fibrous materials.
 1660. J. M. Gilbert, Manchester—Imp. in the construction of cylinders and maundrels used in printing calico and other surfaces.
 1661. J. Dyson, E. W. Shirt, and H. Shirt, Sheffield—Imp. in the mode of rolling strips of steel for crinoline and other purposes.

Dated 12th May, 1858.

1663. L. Durand, Marcellies—An imp. tubular steam generator.
 1664. M. Dicoy, 123, Fenchurch street—Imp. in machinery for preparing or manufacturing granulated potatoes for preservation. (A com.)
 1665. J. A. Détrouy, 10, Rue de Choiseul, and F. Teubert, 18, Rue de Choiseul, Paris—Imp. in apparatus for cleansing hair combs, and other similar articles.
 1666. J. A. Clarke, Liverpool—Imp. in composition for coating vessels' bottoms.
 1667. W. Mark, Stockton-on-Tees, Durham—Imp. in roofing and other tiles.
 1668. J. West, 234, Shales Moor, Sheffield—A mode of covering and securing waterpots and branches.
 1669. A. H. Rogers, Fairfield, Manchester—Imp. in lubricators.
 1670. J. Sharples, Crawshaw Booth, near Rawtenstall—Imp. in extracting moisture from and drying porous and fibrous substances.
 1671. E. Knight, Foster-lane, Chesapeake—Imp. in apparatus for refrigerating, also for bottling aerated liquids, and in the preparation or storing salts for the production of artificial mineral waters.
 1672. J. G. Jackson, Belper, Derby—A method of carrying roads over (or through) land covered with water.
 1673. J. Biggs, Norton Folgate—Imp. apparatus for compressing vegetable and other substances.
 1674. A. L. Liétout, Paris—Improved portable medical and hygienic gymnastic apparatus.

1675. J. S. Bailey, and W. H. Bailey, Keighley, Yorkshire—Imp. in machinery for preparing and combing wool, cotton, and other fibrous materials.
 1676. J. Hamilton, Belfast—Imp. in the preparation and use of starch for manufacturing, bleaching, and finishing purposes.

Dated 13th May, 1858.

1677. W. Simons, Glasgow—Imp. in the construction of iron ships or vessels.
 1678. R. Halsey, junr., Preston Pans, Haddington, N.B.—Imp. in machinery or apparatus for dressing or cleansing and separating grain and seeds.
 1679. A. M. Dix, Hasley, Staffordshire—Certain imp. in the process of brewing or obtaining decoctions, and in apparatus connected therewith, which apparatus is also applicable to condensing, refrigerating, or other such like purposes.
 1680. F. A. Delry, Soissons, France—An improved mechanical kneading trough.
 1681. A. Wolf, Paris—Imp. in musical instruments.
 1682. H. Hyde, Truro, Nova Scotia—An improved mode of, and improved apparatus for, manufacturing oils. (A com.)
 1683. J. Gardner, Banbury—An imp. in chaff-cutting machines.

Dated 14th May, 1858.

1684. F. Warren, Birmingham—Imp. in the construction of shafts for telescopes and other instruments.
 1685. J. Colgate, 56, Exmouth street—A "pipe case handle" in walking sticks, canes, riding whips, and umbrellas.
 1686. S. Carpenter, Flushing, U.S.—Imp. in components for valves and other time keepers.
 1687. D. Dick, 55, George-street, Paisley—Improved cutters in trousers and other similar uses.
 1688. W. E. Newton, 66, Chancery-lane—Imp. in the construction of lamps. (A com.)
 1689. G. F. Chestrell, Liverpool—An improved waterpots like paint.
 1691. L. Petre, Hatton-garden—Imp. in the application of glass to ornamental and useful purposes.

Dated 17th May, 1858.

1692. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the construction of artificial legs and feet. (A com.)
 1694. J. Allen and W. Allen, Wallend, Northumberland—Imp. in the treatment of iron and copper pyrites, and in apparatus for same.
 1696. J. Wittenberg, Cambridge-villas, Notting-hill—Imp. in more power engines actuated by air.
 1698. W. Raymond, Dalton—Imp. in life rafts.
 1700. S. Hiller, Havestraw, U.S.—An improved method of tinning or amalgamating iron with silver, copper, brass, or other metals, or alloys of metals.
 1702. S. Higgs, junr., Penzance—An imp. in separating or purifying copper from water having it in solution.

Dated 18th May, 1858.

1704. W. J. Hixon, 8, Victoria-grove-terrace, Baywater—Imp. in the construction of reaping and mowing machines, and the form or shape of the knife or knives to be used in connection therewith.
 1706. J. Mallison, junr., Bolton le-Moors—Imp. in the process of and in the machinery or apparatus for dyeing yarns.
 1708. E. C. Brochand, Gerard-street—A travelling mill and improved millstones, part of the invention being applicable to other apparatus turned or worked by horses.

WEEKLY LIST OF PATENTS SEALED.

<i>May 26th.</i>		<i>June 1st.</i>	
2972. T. Kaye.	686. C. Chifford.	2984. T. J. Thompson.	
2985. D. Lane.	690. R. Petar.	2998. L. F. E. Clear.	
2989. J. Eccles.	749. E. Foster.	3003. C. Henwood.	
2991. W. Bird, R. Ashton, and T. Bird.	752. S. O. Mason.	3004. W. Parsons and J. Ash.	
3036. C. Nightingale.	753. E. Richmond.	3021. J. Brinton and J. Colver.	
3058. W. Denne.		323. W. C. Smith.	
3163. H. C. F. Wilson & T. Green.		641. J. Horton.	
3183. E. Gomes and W. Mills.		679. F. A. Gatty.	
336. E. Reader and J. Dewick.			
344. W. Chadwick.			
444. J. N. Hearder.			
587. W. E. Newton.			

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

<i>May 30th.</i>		<i>May 30th.</i>	
1191. F. H. Mabery.		1231. W. A. Henry.	
1203. J. Avery.		1243. C. T. Dunlop.	
1230. G. Rogers.		1267. A. Norton and E. Hunt.	
<i>May 27th.</i>			
1263. H. Cartwright.			

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the	Date of	Title.	Proprietors' Name.	Address.
Register.	Registration.			
	June 2.	A Furnace for Smelting and Refining Iron.	J. Clayton	Wolverhampton.

Journal of the Society of Arts.

FRIDAY, JUNE 11, 1858.

SEVENTH ANNUAL CONFERENCE.

The Institutions in Union are requested to take notice that the Seventh Annual Conference between the Representatives of the Institutions in Union and the Council, will be held on Thursday, the 24th of June, at 10 o'clock in the morning. O. Wentworth Dilke, Esq., Chairman of the Council, will preside. Institutions are requested to forward, as soon as possible, to the Secretary of the Society of Arts, the name of the representative appointed to attend the Conference.

The Chairmen of, or Representatives from, the several Local Boards of Examiners, are invited to attend the Conference, as matters connected with the arrangements for the next year's Examinations will, amongst other subjects, be brought under consideration.

ANNUAL DINNER.

The One hundred and fourth Anniversary Dinner of the Society will take place at St. James's Hall, Piccadilly, on Thursday, the 24th instant, at half past five for six o'clock punctually. Members and their friends are requested to take notice that tickets (price 10s. 6d. each) may be had at the Society's House, on and after Wednesday next, the 16th instant.

CONVERSAZIONE AT SOUTH KENSINGTON.

The following letter has been addressed by the Council of the Society of Arts to the Lords of the Committee of Council on Education :—

Society of Arts, Manufactures, and Commerce,
Adelphi, London, W.C., June 9th, 1858.

MR LORDS,—I am directed by the Council of the Society of Arts to thank your Lordships for the advantage which the Society enjoyed in holding its Conversation, by your permission, in the Museum at South Kensington, on Saturday, the 8th ult.

The Conversation was attended by more than 2,280 persons, principally members of the Society and of Institutions in union with it.

The requisite arrangements were skilfully made by your officers; the whole of the building was opened to the visitors; and the collections, which were examined with much interest, were generally and very highly appreciated.

In making this communication to your Lordships, the Council cannot confine themselves to an expression of thanks for the advantages which the Society enjoyed on the particular occasion referred to. The Council avail themselves of this opportunity to record how highly, on public grounds, and in the interests of "Arts, Manufactures, and Commerce," the Society appreciates the wise liberality which has characterised the regulations

laid down by the Committee of Council in respect of the public uses of the Museum at South Kensington.

It is open, on certain evenings of each week, to the general public, free of charge; and on certain other evenings of each week it may be visited by Societies which promote Art, Science, or Education.

The creation and maintenance of museums and similar establishments, at the expense of the public, can only be justified when they are open as fully and freely as possible to the use of the public; and there are large masses of persons, quite capable of profiting by visits to museums, who are practically debarred from using them if they are closed during the evening. Your Lordships are aware that immense numbers of persons have used the privilege of visiting the Museum at South Kensington of an evening, and the Council of the Society of Arts cannot but express its earnest hope that the success of the great experiment which your Lordships have tried, may lead to the adoption of the same wise liberality in other departments.

I have the honour to be, my Lords,
Your Lordships' most obedient servant,
P. LE NEVE FOSTER, Secretary.

BRITISH HONDURAS.

The following communication has been received from the Honourable R. Temple, Chief Justice of British Honduras :—

As the importance of British Honduras becomes more recognised—as, in a commercial point of view, its value becomes more appreciated, the more desirable is it that all doubts as to its being a dominion of the British Crown should be removed. There has been much misapprehension upon this subject, owing to an ignorance of many of its real features. All the disputes which have arisen with our Transatlantic friends, within the last six or seven years, respecting our tenure of Honduras, have been grounded upon the assumption, on the part of the American writers and statesmen, that the treaties of 1783 and 1786, between Great Britain and Spain, remained unrescinded, although neglected, but were like some law which for a number of years had fallen into desuetude, but which might at any time be drawn from its dark and dusty corner, and, like the dry bones of the Prophet's vision, be made to assume its original vitality and vigour. Upon this assumption the argument, on the American side, has hitherto been based. I trust that I shall be able to prove very satisfactorily that nothing can be more erroneous than such a supposition.

I wish to speak with the greatest respect of the United States as a nation. I wish most carefully to avoid using a single expression calculated to cause any angry feelings in the minds of the energetic, enterprising, courageous, intellectual, but somewhat irritable people of that country, but I cannot refrain from charging them with a meddling disposition and an arrogant spirit, in presuming to dictate to the British Government as to what are and what are not the rights of the British Crown with respect to territories to which they themselves cannot have the slightest pretensions. What is it to them whether we have or have not any territorial rights in British Honduras? That is a question to be discussed, if discussed at all, with Spain, and not with the United States. Even assuming it to be a fact (and it is very far from being so) that Mexico and the Central American States succeeded to all the rights which Old Spain formerly possessed, still, the United States could not, with any show of reason, upon this ground, pretend to dispute our sovereignty in Honduras, for the question would then be between Great Britain and those States. As well might the United States dispute our right to Jamaica, or question our claims to New Zealand and Australia. "But (says Mr. Buchanan) Mr. Monroe, when President of the United States, had, in 1823, announced, in a public message to Con-

that the American continents were not henceforth to be considered subject to colonization by European Powers." Who constituted Mr. Monroe the lawgiver of nations,—the Lycurgus of the world? What does it signify to us what doctrine Mr. Monroe chose to lay down in his presidential address to Congress? Other countries were not bound by it. Suppose Mr. Monroe had added, "Neither shall the islands in the Caribbean Sea be subject any longer to European sway. Cuba shall be released from the yoke of Spain, and Great Britain shall be relieved from the burthen of governing Trinidad and Jamaica." Such language would certainly be very ridiculous, but it would be in accordance with the principle of his doctrine. If the President of the United States is empowered to lay down, when addressing Congress, territorial doctrines unknown to Vattel, unmentioned by Grotius, the same liberty cannot be denied to the Queen of Great Britain, and she might with equal propriety lay down the rule in her next speech to Parliament that the United States shall not be permitted to trade with China, shall not be allowed to have any commercial intercourse with India, that Japan shall be a sealed book, and the Philippine Islands forbidden ground. Such a determination on the part of our Most Gracious Queen, addressed to the British Parliament, would be quite as rational as that which was announced by Mr. Monroe to the American Congress.

But notwithstanding this arrogant annunciation, which was quoted by Mr. Buchanan for the purpose of inducing the British Government to abandon the territories of the crown in the Bay of Honduras, it is satisfactory to observe that it received no craven and pusillanimous response from the power to which it was addressed. Lord Clarendon, with that dignified firmness which belongs to him, in his letter to Mr. Crampton, dated May 27th, 1853, says:—"But Great Britain has nowhere in the treaty of April, 1850, renounced, nor ever had any intention to renounce, the full and absolute right which she possesses over her own lawful territories in Central America."

Mr. Buchanan says, "It would be a vain labour to trace the history of the connection of Great Britain with the Mosquito shore and other portions of Central America, previous to her treaties with Spain of 1783 and 1786." This is a mistake. There is no difficulty whatever in tracing the occupations of the British in the Bay of Honduras to their origin, and this I will now proceed to do. But I would first rectify an error which all American politicians and diplomatists commit, when speaking and writing on this subject. They represent British Honduras as being in Central America. It is no such thing. Previously to the revolt of the several States which now come under that denomination, the term "Central America" was unknown. The whole of the country which is now split into the petty States of Guatemala, Honduras, San Salvador, and Costa Rica, was called the Kingdom of Guatemala, which stretched as far in a northerly direction as the Hondo, and some writers assert, and those Americans, that it went even beyond that river. It comprised Vera Paz and Chiapas. But in 1821 the whole of the country between the Sarstoon and the Hondo had been for many years in the undisputed and peaceable possession of the English, and had long ceased to be considered as a portion of Guatemala. The term Central America, therefore, being applied only to the states which at that time asserted their independence, excluding Guatemala as it then existed, and so much of it as was under the dominion of Spain,—British Honduras cannot with propriety be said to be a part of it.

It can be clearly proved that during the Commonwealth, in the year 1653, the English logwood cutters had succeeded in firmly establishing themselves in the whole of the country between the Siban and the Hondo, and had also occupied all the islands in the Bay of Honduras, including what are now called the Bay Islands.

That they had many a hard tussle for these possessions with the few inhabitants who were scattered over the unclear tracts between the limits above mentioned, and that much unjustifiable violence, and many deeds of rapine and savage cruelty were committed, there is little doubt; but that they succeeded in firmly planting themselves on the soil there is as little. The Spaniards made many ineffectual attempts to remove them. But the Spaniards, in the reign of Phillip IV. were not like those in the time of Charles I. They were not like those indomitable spirits who followed Cortez and Pizarro through difficulties and dangers, and performed feats of daring, the narrative of which is more like the romantic account of the wondrous deeds of Orlando, the heroic actions of Godfrey, and the valorous achievements of the Cid, than authentic history. They differed as much from them as the effeminate Romans of the latter days of the Empire, who became the easy spoil of the wild hordes of Attila and Alaric, differed from the invincible cohorts of Scipio, or the impregnable legions of Caesar,—or the dastardly Greeks of the present day from those who fought at Salamis and Plataea. It is an old saying, "What cannot be cured must be endured." Whether Charles II. the successor of Phillip, had ever heard this apothegm, I cannot say, but he certainly acted in the spirit of it, for in the year 1760 he concluded a treaty with Great Britain, the 7th article of which is as follows:—

"All offences, damages, losses, injuries, which the nations and the people of Great Britain and Spain have at any time heretofore, upon any cause or pretext whatsoever, suffered by each other in America, shall be expunged out of remembrance, and buried in oblivion, as if no such thing had ever passed.

"Moreover, it is agreed that the Most Serene King of Great Britain, his heirs and successors, shall have, hold, keep, and enjoy for ever, with plenary right of sovereignty, dominion, possession, and propriety, all those lands, regions, islands, colonies, and places whatsoever, being, or situated in, the West Indies, or in any part of America, which the said King of Great Britain and his subjects do at present hold and possess, so as that in regard thereof, or upon any colour or pretence whatsoever, nothing may, or ought to be urged, nor any question or controversy be even moved, concerning the same hereafter."

Had this treaty been undisturbed, I presume no question could ever have arisen respecting our right to British Honduras, the Bay Islands, and the Mosquito shore. But in 1783 and 1786, Mr. Pitt being First Lord of the Treasury in the latter year, with a most short-sighted policy we agreed to treaties which extinguished our sovereignty over territories which had been solemnly sanctioned by the crown of Spain.

In a long statement made by Mr. Buchanan, in reply to Lord Clarendon, dated July 22, 1854, the following observations are contained:—

"The British statement claims the territory between the Siban and the Sarstoon by right of conquest, and observes, that the treaty of 1786 was put an end to by a subsequent state of war with Spain, and during that war the boundaries of the British settlement in question were enlarged; and that the subsequent treaty of peace not having revived the treaties of 1783 and 1786, Great Britain is entitled to retain this territory.

"It may be observed that the statement does not mention at what period the boundaries of the British settlements were enlarged. If this took place, as it is believed it did, after the date of the treaty of alliance between Great Britain and Spain in 1809, which terminated the war, then this argument falls to the ground. If before 1809, Great Britain, when concluding this treaty, ought to have informed Spain that she intended to convert the encroachments of the settlers in Belize on Spanish territory into an absolute right. That she did not then intend to pursue such a course towards an ally in distress, is clear from her subsequent conduct.

"In 1814, Great Britain revived all her pre-emptive

commercial treaties with Spain; and what is the privilege granted to her by the treaty of 1786, of cutting mahogany, logwood, and other dyewoods on Spanish territory, thus enabling her to extend British commerce by those articles, but a commercial privilege?

"So far from the treaty of 1786 being put an end to by the war, its continued existence in 1817 and 1819 was recognised by the Acts of the British Parliament. These declare, in so many words, that 'Belize was not within the territory and dominion of his Majesty,' but was merely 'a settlement for certain purposes, in the possession and under the protection of his Majesty.'

"For the nature of this 'settlement' and a knowledge of these 'certain purposes,' we can refer nowhere except to the treaties of 1783 and 1786.

"In addition to these Acts of Parliament, it is proper here to report, that so late as 1826 Great Britain has, by her treaty with Mexico, acknowledged the continued existence and binding force of the treaty of 1786."

These arguments against the territorial rights of the British Crown in Honduras I shall now humbly endeavour to answer.

It is freely admitted that, whatever might have been the rights of the British Crown previously to the treaties of 1783 and 1786, under those treaties the subjects of his Britannic Majesty had a qualified occupation of Honduras. The treaties gave to them limited privileges, and were most careful in avoiding any expression which could be construed into a grant of territory. It is most freely admitted there, that under the treaties in question, we can have no claim beyond those privileges, the exercise of which was to be confined within certain specified limits. I have already expressed my surprise and regret that the government should have been so impolitic and shortsighted, considering the vantage ground which they held, as to have agreed to those treaties, but of this I am convinced, that however wrong they might have been, as regarded the interests of Great Britain in the course which they adopted, they acted with perfect good faith towards Spain. It is more than doubtful whether Spain acted in a similar spirit towards Great Britain; but, let the intentions of the former power have been what they might, this fact is certain,—we strictly observed the provisions of the treaties. Spain did not. One of the stipulations of the treaty of 1786 was, that the English should evacuate the Mosquito shore. They did evacuate it. One article prohibited the building of any fort. No fortification of any sort was constructed. Another forbade the cultivation of the soil for the purpose of exporting its produce. No cultivation was attempted. Another confined all wood-cutting operations between the Hondo and the Silan. Beyond those rivers the cutters did not go. In short, there was not a single particle of the treaties which the English settlers did not religiously observe. And how did the subjects of His Most Catholic Majesty conduct themselves in reference to them? It is a notorious fact, that the English were constantly liable to the attacks of the Spaniards, who sought every opportunity to disturb them in their peaceful occupations, in the hope that, harassed, worn, vexed, tired out, they might be induced to abandon a country where they had no quiet, where they could not sleep in safety, where they must constantly have their loins girded, and where the fruits of their labour were every hour liable to be stolen or destroyed. In the year 1798, the Spaniards, headed by General O'Neill, the Captain-General of Yucatan, made a grand attack upon the British, but were repulsed with great loss. Notwithstanding that war was declared between Great Britain and Spain in 1796, the settlers did not take advantage of that circumstance to improve their condition, but continued peaceably to follow their cutting operations, and faithfully to observe the treaties. But after the "affair" of '98, there was an end of all treaties—and it was high time. Now, it is a maxim of international law, of universal acceptance, and I think

that our American friends will not repudiate it, that a declaration of war between two countries operates at once as an entire abrogation of all treaties previously existing between them, and that those treaties do not necessarily start again into existence when the war ceases, as naturally as Castor rises when Pollux sets, but that they must be, if it be deemed advisable, specially revived by an express treaty to that effect. In 1783, the Spanish Crown, by a treaty signed at Versailles, granted to the subjects of the King of Great Britain the right to cut logwood in Honduras, under certain restrictions and within particular limits. The convention between Great Britain and Spain, signed in London in 1786, extended those limits, and gave permission to British settlers to cut mahogany as well as logwood. In 1796, war was declared between Great Britain and Spain, and the treaties of 1783 and 1786 were thereby abrogated and annulled. The Spanish Government acted upon this principle, and were perfectly right in so doing. But the subjects of Spain—whether at the suggestion of their government or not I am not prepared to say—had never acted with good faith in respect to the treaties; they had constantly carried on a guerilla war against the subjects of his Britannic Majesty. Now, however, that the treaties had ceased to exist, and they were not bound by any political obligation to respect the persons and property of the English, they were quite justified in compelling them to evacuate the country, if they were able to do so. The Spanish Government, therefore, gave orders to General O'Neill, the Captain-General of Yucatan, to dispossess the English of the lands which they held under the treaties, and drive them out of the country. This officer, as I have before stated, made a vigorous attempt to carry the orders of his government into execution, but he met with a determined and successful resistance, and the British settlers maintained possession of the country which they had previously held, subject to the restrictive provisions of the treaties. But they not only maintained possession of the country, they ceased to regard that possession as a permissive one, and treated it as an absolute possession, founded upon the complete, unqualified ownership of the soil. But this was not all. Considering, as they were justified in doing, that all treaties between Great Britain and Spain were abrogated by the war, and more especially those affecting themselves, which the Spaniards, never faithfully observing, had been the first, by their attack under O'Neill, to declare void, and perceiving that the whole of the country to the south of the Silan (the boundary line of the Convention of 1786) as far as the Sarstoon, was vacant and unoccupied, they took possession of that part which was densely covered with the primeval forest, on which there was not a single habitation, where, perhaps, human foot had never trod before, and where the scream of the vulture, the howl of the jaguar, and the roar of the cataract as it rushed down the mountain steeps, were the only sounds which fell upon the ear. Since that period, the occupation, which then commenced, until the present day, has been continuous. It has never ceased for one moment, and it has never been once disturbed, protested against, or questioned by Spain. At the conclusion of the war between Great Britain and Spain, the treaties of 1783 and 1786 were not revived, nor were they brought into existence at any subsequent period. On the cessation of hostilities, a treaty was concluded between Great Britain and Spain, which was signed in London on the 14th of January, 1809. In this short treaty, which consists of only two articles, no mention whatever is made of the treaties of 1783 and 1786, nor, indeed, of any other treaties; but by an additional article signed in London on the 21st of March, in the same year, the two countries mutually agree to proceed to a regular negotiation of a treaty of commerce as soon as it shall be practicable so to do, affording in the meantime mutual facilities to the commerce of the subjects of each other, by temporary regulations founded on principles of

procal utility. On the 5th of June, 1814, a treaty of commerce was concluded between Great Britain and Spain, in which no mention is made of the defunct treaties of 1783 and 1786. On the 24th of August, 1814, additional articles were signed at Madrid. The first article is as follows:—

"It is agreed that, pending the negotiations of a new treaty of commerce, Great Britain shall be admitted to trade with Spain upon the same conditions as those which existed previously to the year 1796, [or before the war broke out], all the treaties of commerce which at that period subsisted between the two nations being duly ratified and confirmed."

From the terms of this article it has been hastily and illegally concluded that the treaties of 1783 and 1786 were revived, but upon a careful consideration of the words, and an examination of the strict meaning of those words, it will, I think, be admitted that they will not bear that construction:—

"It is agreed that Great Britain shall be admitted to trade with Spain upon the same conditions as those which existed previously to the year 1796." Was it necessary to revive the two treaties of 1783 and 1786 to enable Great Britain to do that? Assuredly not; there is not one word in those treaties relating to the trade between Great Britain and Spain, and if there had been, only so much of the treaties would have been revived as stated the "conditions" of that trade. If then we were allowed to trade with Spain "upon the same conditions" as those which existed before the war, it was useless going to those treaties to ascertain the conditions, because they are not there stated, and only those treaties were revived which did state the conditions. No one who has read *Whateley or Watts* could come to any other conclusion. But the logic of those who draw a different inference is somewhat akin to that of the young gentleman who offered to prove to his astonished guardian that "an eel-pie was a pigeon." Neither does the article above quoted mention by name, or in the most distant manner allude to, the treaties in question. *Vattel* says, "As every power at war pretends to have right on its side, and this pretension is not liable to be judged by others, the state of things at the instant of the treaty is to be held legitimate, and any change to be made in it requires an express specification in the treaty, consequently all things not mentioned in the treaty are to remain as they were at the conclusion of the war." And again, "Preceding treaties, mentioned and confirmed in the last, make a part of it." Now, in the convention of 1814 no mention whatever is made of the treaties of 1783 and 1786. But the article above quoted says, "All the treaties of commerce which at that period subsisted between the two nations, being hereby certified and confirmed." Now, if the treaties of 1783 and 1786 were treaties of commerce, they are revived by those words. What is a treaty of commerce? It is an agreement, or contract, entered into between two countries, by which the subjects of each are to be permitted to trade with each other in those countries, or their dependencies, they being allowed to have reciprocal advantages. It differs from a political treaty, which is a contract, not relating to mutual trade and commerce, but to territorial limits and boundaries, or the acts and deeds which the governments themselves may or may not perform; and from a treaty defensive and offensive, which is a treaty of alliance, by which each country engages to assist the other with arms, if war should break out between either of them and some other power. It may be general, or it may have reference only to a particular war. Now, I assert that the treaties of 1783 and 1786 were not treaties of commerce. Not one word is mentioned in either of them respecting the mutual trade and commercial relations of the two countries. The revival of them would not have enabled Great Britain to trade with Spain, more than she could have done with-

out them; and over our commercial transactions with that country, since the convention of 1814, they have not exercised the slightest influence. But Mr. Buchanan contends that they are treaties of commerce, because, says he, "what is the privilege granted to her by the treaty of 1786, of cutting mahogany, logwood, and other dyewoods on the Spanish territory, thus enabling her to extend British commerce in these articles, but a commercial privilege?" This argument belongs to the class of those which prove that an eel-pie is a pigeon, that a cat is three tails, and the like absurdities. One country by a treaty grants to the subjects of another country the use of a certain territory, by which use the grantees are enabled to carry on a particular kind of trade, not with the subjects of the grantor, but with their fellow-subjects, *ergo*, that treaty is a treaty of commerce. So, if I leave to Mr. Buchanan for a term of years certain tan pits, by the use of which he is able to pursue his trade, and supply his customers with leather, I, by that leave, enter into a contract of trade with him. Nothing can be more ridiculous. A treaty of commerce is not a treaty granting certain privileges, by which the grantees are enabled to carry on a particular trade, but it is a treaty between two countries, by means of which the subjects of those countries may trade with each other in the articles peculiar to each country, in which commercial intercourse they receive facilities and advantages denied to the subjects of other countries not being parties to the treaty. That is a treaty of commerce. Neither the treaty of 1783 nor that of 1786 was such a treaty.

They are not styled Treaties of Commerce. That of 1783 is called "A Definitive Treaty between Great Britain and Spain," and that of 1786 "A Convention between Great Britain and Spain." The difference between a treaty and a convention I take to be this. A treaty is general and permanent, or intended to continue for a lengthened period. A convention relates to some particular object, or it is temporary, or provisional. The treaty of 1783 was a "treaty of peace," not a treaty of peace and commerce. But the one great and leading object of the treaty is made sufficiently manifest by the sixth article, which commences as follows:—

"The intention of the two high contracting parties being to prevent, as much as possible, all the causes of complaint and misunderstanding heretofore occasioned by the cutting of wood for dyeing, or logwood, and several English settlements having been formed and extended under that pretence upon the Spanish continent, it is expressly agreed that his Britannic Majesty's subjects shall have the right of cutting, loading, &c."

One great object of this treaty, then—which, no doubt, was a general treaty of peace—is obvious. The English had formed settlements upon the Spanish continent, in consequence of which disputes had arisen between them and the subjects of the crown of Spain, but, "to prevent, as much as possible, all causes of complaint and misunderstanding," the crown of Spain gives permission to the English to cut logwood within certain limits, and under certain restrictions. This, then, was the principal object of the treaty, not to enable the subjects of his Britannic Majesty to trade with the subjects of the Crown of Spain, but to prevent, by confining the British within certain limits, where they might be at liberty to cut logwood, "all causes of complaint and misunderstanding." On this treaty, then, be correctly called a treaty of commerce? It is not stated that there was to be any trade with Spain. The logwood, when cut, was shipped to England, and there is no provision whatever that there should be any commercial intercourse of any kind between the subjects of the two crowns. On the contrary, the intention of the treaty seems to have been that all intercourse should cease, and, "to prevent complaints and misunderstandings," each should be confined within its own limits. Indeed, a little reflection will convince anyone that a treaty of commerce between the two nations would have been, under the circumstances, an

absurdity. When a treaty of commerce is agreed upon between two countries, it is supposed that each country produces articles which the other country does not produce, but which it requires. For instance, by the treaty between Great Britain and Portugal, in 1703, commonly called the 'Treaty of Methuen,' because it was negotiated by John Methuen, the British Ambassador Extraordinary in Portugal, it was agreed that the woollen manufactures of Great Britain should be admitted into Portugal as had been formerly accustomed, upon condition that wines of the growth of Portugal should be admitted into Great Britain on payment of two-thirds of the duty which was demanded for French wines. Ever since that period the English people have been poisoned by potations of such Port, instead of being invigorated and enlivened by wholesome draughts of Bordeaux and Burgundy.

This was a treaty of commerce, and it is intelligible to suppose a company of Englishmen were to settle in Portugal, and, like Noah, of blessed memory, plant vineyards, where would be the use of a treaty of commerce between them and the Portuguese?—they could only get tort in exchange for Port. In like manner, of what use as a treaty of commerce between the British settlers in Honduras and the Spaniards?—the former could only have supplied the latter with logwood, and of that article they had more than sufficient. Besides logwood, be only article in which the settlers dealt, would have been of no use to the Spaniards, because they had no manufacturers requiring the use of that dye. England was the only country at that time which made use of logwood, and England, therefore, was the only country which supplied a market to the cutters.

The treaty of 1783, then, was clearly not a treaty of commerce. Was that of 1786? This treaty is, in principle, the same as the former one. It extends the limits, and it grants permission to cut mahogany as well as logwood. It also stipulates for the performance of certain conditions, such as the evacuation of the Mosquito country, and the abstaining from erecting fortifications. But there is not a single word about trade, or is there one expression from which we may gather that it was the intention of the contracting parties that the subjects of the two crowns should have any commercial intercourse with each other. But the 9th article of the treaty of 1783 affords the most convincing proof that that treaty was not considered—not intended to be—a treaty of commerce. It is as follows:—"Immediately after the exchange of the ratifications, the two high contracting parties shall name commissioners to meet concerning new arrangements of commerce between the two nations, on the basis of reciprocity and mutual commerce, which arrangements shall be settled and concluded within the space of two years, to be computed from the 1st of January, 1784."

From this article nothing can be clearer than that the treaty of 1783 was not itself considered, nor intended to be, a treaty of commerce, inasmuch as it agrees that commercial arrangements shall be entered into within the space of two years after the 1st of January, 1784. The commercial arrangements were *in futuro*, there were none *presenti*.

The treaties of 1788 and 1786, then, were not treaties of commerce, and the convention of 1814, which confirmed all the treaties of commerce which had subsisted before the war, could not confirm them under that denomination. Did that Convention, then, confirm them socially? The definitive treaty of 1783 confirms a number of treaties, but it confirms by name, as the treaty of Westphalia, of Madrid, of Utrecht, of Baden, of Seville, of Aix-la-Chapelle, &c. The convention of 1814 never mentions nor alludes to them, and we have seen that, according to Vattel, "all things not mentioned in a treaty are to remain as they were at the conclusion of the war." Is there any other treaty which, it is intended, revived those of 1783 and 1786? No! The

convention of 1814 is the only one which has been supposed to have exercised that resuscitating power.

Mr. Buchanan, in his statement to the Earl of Clarendon, dated January 6th, 1854, admits that the treaties of 1788 and 1786 were abrogated by the war, and that they had no existence, unless they had been revived by some subsequent treaty. He says:—"At what period, then, did Great Britain re-open her claims to the country of the Mosquitoes, as well as to the continent in general? * * * It certainly was not in 1814, when the commercial treaties which existed between the two powers, including, it is presumed, those of 1788 and 1786, were revived."

Mr. Buchanan admits that those treaties were not in existence unless they were revived, and that they were not revived by the convention of 1814 unless they were commercial treaties. I repeat that he admits this, for he says, "when the commercial treaties, including, I presume, those of 1788 and 1786, were revived."

Now, I think, I must have proved to the satisfaction of any reasonable person, that the treaties of 1783 and 1786 were not commercial treaties, and, therefore, that the convention of 1814, even in the opinion of Mr. Buchanan himself, did not revive them. Then they were never revived—then, they having been abrogated by the war, do not now exist, nor have they had any existence since the year 1796.

"When," says Mr. Buchanan, "did Great Britain renew her claim?" We claim ever since the year 1798, at which period we occupied, and have ever since continued to do so, the whole country between the Hondo and the Sarsteon, without any remonstrance from Spain, without expostulation or complaint of any kind.

Now I contend, and I believe I shall be borne out in my opinion by all writers on international law, that the British crown possesses a clear, substantial, indefeasible right to British Honduras, founded upon *usucaption* and *prescription*.

Vattel says, "Usucaption is the acquisition of domains founded on a long possession, uninterrupted, and undisputed, that is, on an acquisition solely proved by this possession. Prescription is the exclusion of all pretensions to a right founded on the length of time during which it has been neglected. * * Prescription being only founded on an absolute or lawful presumption, it has no place if the proprietor has not really neglected his rights. This condition implies three particulars:—1. That the proprietor cannot allege an invincible ignorance, either on his own part or that of his friends. 2. That he cannot justify his silence by lawful and solid reasons. 3. That he has neglected his right, or kept silence during a considerable number of years."

Now, let us see if these three conditions have been complied with. 1st. "That the proprietor cannot allege an invincible ignorance."

What is an invincible ignorance? It is not wilful ignorance, it is not an ignorance arising from forgetfulness and inattention,—but it is an ignorance which exists notwithstanding the most active and the most earnest endeavours to find out the truth. I will state the definition which the Roman Catholics give of invincible ignorance, which probably we may, as good Protestants, not be disinclined to adopt, inasmuch as it is borrowed from St. Augustine: "Catholic divines and the holy fathers, at the same time that they strictly insist on the necessity of adhering to the doctrine and communion of the Catholic Church, make an express exception of what is termed invincible ignorance, which occurs where persons out of the True Church are sincerely and firmly resolved, in spite of all worldly allurements, on the one hand, and of all opposition on the other, to enter into it if they can find it out, and when they use their best endeavours for this purpose." Now, taking this as a correct definition of invincible ignorance, and it is in this sense, in my opinion, that Vattel uses the expression, can Spain plead an invincible ignorance of the British possessions of Hon-

duras? Of the exercise of territorial rights on the part of the British Crown in Honduras? Of the commission of acts and deeds in Honduras expressly prohibited by the treaties of 1783 and 1786? Has she made every inquiry? Has she adopted every means within her power? Has she conscientiously, sincerely, and earnestly sought information? And, notwithstanding all her endeavours, has she been for the last sixty years in profound ignorance that Honduras was in the possession of the British Crown, and was treated by her as an absolute dominion? The supposition is too absurd. Pass we then on to the next condition.

2. "That he cannot justify his silence by lawful and solid reasons."

Assuming Spain to have been silent in respect to her supposed rights, what lawful and solid reasons can she allege to account for that silence? I am not aware of any reasons. Perhaps Mr. Buchanan may know of some; but until he publishes them to the world, I will assume that none exist, nor ever have existed.

3. "That he has neglected his right, or kept silence for a considerable number of years."

That Spain has done this, can, I think, be very clearly proved. The 4th article of the Convention of 1786, after stipulating that no fortification shall be erected, nor any body of troops posted, nor any piece of artillery kept at St. George's Key,* concludes as follows:—"And in order to verify with good faith the accomplishment of this condition *sine qua non* (which might be infringed by individuals, without the knowledge of the British Government), a Spanish officer or commissary, accompanied by an English officer or commissary, duly authorised, shall be admitted twice a-year, to examine into the real state of things."

At the end of the convention, there is the following declaration, signed by the Plenipotentiaries:—

"At the time of exchanging our Sovereign ratifications of this convention, signed the 14th of July last, we the undersigned Ministers Plenipotentiaries have agreed that the right of the English and Spanish commissaries, mentioned in the 4th article with respect to the island of Cago Casina, is to extend in like manner to all the other places, whether in the islands or on the continent, where the English cutters shall be situated. In witness, &c."

Up to the year 1796, a period of ten years, the Spanish commissaries made with the greatest regularity their half-yearly visits. Since that period, such a person as a Spanish commissary has never been seen at St. George's Bay, or in any part of British Honduras. The fact is undisputed, that for the last sixty years no commissary has been despatched from Spain. "Oh, but," says Mr. Buchanan, "the convention of 1814 revived all commercial treaties, and I suppose those of 1783 and 1786 were included." What Mr. Buchanan's supposition may be is a matter of little consequence; it was clearly not the supposition of Spain, or else why not send the Spanish commissary as agreed to by the latter treaty? But no commissary did she ever send. Here, then, is conclusive evidence, if Spain considered that her right to British Honduras still existed, that she neglected that right. But has Spain, by her representative at the Court of St. James's, ever remonstrated with the British government on the fact of that government treating Honduras as a dominion of the British Crown? Have they said, "You have sent soldiers, you have planted artillery, you have erected Courts of Justice, you have appointed a

Governor, who, although called a superintendent, is a Governor to all intents and purposes. Now, all these acts you must be aware are in direct violation of the express terms of the treaties, which, though abrogated by the war, were revived by the Convention of 1814. It is, therefore, my duty to inform you, that this state of things must be put an end to; it is not to be tolerated any longer. Those soldiers must be sent from the country; that artillery must be shipped off; those Courts of Justice must be dissolved; your House of Assembly must 'be no longer a Parliament,' as a distinguished personage of your country said on a memorable occasion, and your superintendent, as you choose to call him, and all other officers not authorised by the treaties, must be sent about their business." Has Spain, I say, by her representatives, ever spoken in this language? No, nor anything like it. On the contrary, she has always exhibited the most meek and lamblike submission to our possession of the country; and it is my opinion that nothing would so much disconcert her as to say to her, "Honduras has been a bone of contention between America and us for sometime. We are tired of the dispute. Here, the country is yours: take it and keep it." It is not difficult to imagine what sort of a man she would make to such a liberal offer. "Why, we should hardly keep Cuba out of the rapacious grasp of the filibustering Yankees;—Cuba, which contributes tens of millions of dollars a year to our exchequer; and do you wish us to be burdened with Honduras, that won't pay us a single cent? No, no, keep, keep it in Heaven's name."

It is quite evident, then, that our title to British Honduras by usucaption and prescription is an indefeasible one; that the conditions laid down by Vattel have been complied with. "1st. That the proprietor cannot show an invincible ignorance. 2nd. That he cannot justify his silence by lawful and solid reasons. 3rd. That he has neglected his right, or kept silent for a considerable number of years." But the right of Great Britain to British Honduras has been recognized by various countries, by their sending consuls there, and demanding of the British exequaturs for those consuls. The United States sent a consul, Guatemala sent a consul, Spain sent a vice-consul, France sent a vice-consul, and there is a Mexican consul there at the present moment. But what does that signify? Mr. Buchanan is not frightened at that or any other difficulty. His gauntlet is always ready, and his trenchant blade glitters in the air, and he slashes away at what would terrify other people. He reminds me of the Frenchman's eulogistic song about General Jackson, in "Matthews's Trip to America:—

"They come ten thousand strong,
But what was that to Jackson
He was always ready for action,
He beat them every one."

Mr. Buchanan would have been an admirable subject for the laudatory lyrics of the Gallic songster. "He is always ready for action, and, like Hotspur, in the way of bargain he will cavil on the ninth part of a hair." Hear what he says about the appointment of consuls. "The appointment of a consul recognises nothing more than the *de facto* possession of the post by the power from which his *exequatur* is received. Such an appointment does not in the slightest degree interfere with the question of the right *de jure* of this power to be in possession. This has ever been, and this must ever be, the law and practice of modern commercial nations. If it were otherwise, the power before the appointment of a consul, the government of a nation must first carefully inquire whether the party in possession be the rightful owner of the port, and if they determine against its right, then the commerce with it must cease altogether, or remain without consular protection. This would be a novel doctrine to maintain in the present age of commercial progress."

It would not be difficult to expose the fallacy of the reasoning, but I am spared the trouble of doing so, as

* St. George's Key is a small island, about nine miles from Belize. It was called by the Spaniards Casina, and sometimes Cago Casina. Casina signifies a farm-house or cottage, and Cago a rock or small islet in the sea. The sea, for upwards of the coast of Honduras is a complete archipelago, innumerable keys or islets. These give it the appearance of an enclosed lake than a part of the

such as it has been sufficiently answered by Mr. Clayton, another American statesman, of considerable learning and ability. That gentleman, in a letter addressed to Messrs. James and Seaton, Washington, dated January 7th, 1853, says, "The British title to the Central American States was recognised by Mr. Polk, in sending there Mr. Christopher Hempstead as consul, who remained in British Honduras, under the protection of the British flag, and a virtue of an exequatur obtained by Mr. Buchanan from the British Government, nearly three years, till I recalled him to prevent the possibility of any charge against General Taylor's administration of having recognised the English authority in Honduras."

Mr. Clayton speaks like an honest man. He says plainly and distinctly that Mr. Polk, the President of the United States, did recognise the British title by sending consul to Honduras, and that when General Taylor became President, he recalled him, in order that he, General Taylor, should not be accused of recognising that title.

Mr. Clayton's letter to Mr. Hempstead, dated March 1st, 1850, is curious. He says, "As it is presumed that the appointment of a consul of the United States at Belize, even if required by our trade with that port, may have been made without full consideration of the territorial rights of Great Britain in that quarter, it is deemed advisable, under existing circumstances, to discontinue that appointment."

So the appointment of a consul at Belize was quite an accidental occurrence. It was not fully considered. Consuls had to be appointed at various places, and one at Belize was nominated by chance. This reminds me of the humorous observations made by Mr. Burke, in the course of his speech on the subsidiary treaty with the Emperor of Hesse-Cassel. He said:—"That although the King of Prussia had professedly set out merely to obtain adequate satisfaction for the injury done his sister, in army, by accident, took Utrecht, possessed themselves of Amsterdam, restored the Stadtholder and the former government, and all this at a stroke, and, by the bye, which put him in mind of a verse in Cowley's sprightly allusion of the "Chronicle":—

'But when Isabella came,
Arm'd with a resistless flame,
And th' artillery of her eye,
Whilst she proudly march'd about,
Greater conquests to find out,
She beat out Susan—by the bye."

and so, also, I suppose, Mr. Hempstead's appointment was made. It was, no doubt, true that Mr. Polk did not make that appointment; it was true that Mr. Buchanan applied to the British Government for his exequatur; and it was true that, for three long years, the flag of the Union fluttered in the breeze, before Mr. Hempstead's case, in all its stellar magnificence and glory, but all this was accidental, and, by-the-bye, "it was done without consideration." But the moment the subject was considered—the moment it was discovered what a *mauvais pas* Mr. Polk had made, an attempt was made to repair the mischief, and Mr. Hempstead was ordered, without loss of time, to pack up his stars and pocket his stripes.

But, assuming Mr. Buchanan's argument to be correct, namely, that the appointment of such an officer does not recognise the right, but only the fact of the governing power, why does he not now send a consul to Belize? In a letter published in the *New York Weekly Herald* of Dec. 12th, by whom written I have not the slightest idea, I find the following statement, of the correctness of which there can be no question. The writer, having spoken of Spain, France, and Mexico, says:—"All of these governments united have not half of the commercial transactions which the United States has with this settlement; and yet, with five vessels continually trading between here and the United States, with a vast amount of business, of great interest to the

United States, continually being transacted between the two places, the United States has no consul. Not only does the United States lose a portion of her revenue, but many of her citizens engaged in this trade are subjected to loss and imposition, for the want of a consul here, to assist masters in distress, and to protect American interests."

Honduras is supplied with provisions principally from Boston, New York, and New Orleans. Almost all the pork, flour, hams, cheeses, butter, lard, potatoes, and candles, come from those ports. Also, champagne, claret, and dried fruits. Likewise a large amount of iron wire of different descriptions. I ask again, then, why does not Mr. Buchanan send a consul to Belize, seeing that such a proceeding would not be a recognition of the British title? Because he knows that his argument is hollow,—that his reasoning is fallacious,—and that by sending a consul to Belize, he would acknowledge the right of Great Britain to British Honduras.

(To be continued.)

THE ATLANTIC TELEGRAPH.

The experimental expedition for trying in deep water the proposed operations for laying down the telegraphic cable between England and America, has completed its objects, and returned to the Sound on Thursday, 3rd inst., having been absent five days. The ships composing the squadron were the *Agamemnon*, the *Niagara*, the *Valor*, and the *Gorgon*, and they left the Sound at about four o'clock on Saturday, May 29. The weather was extremely fine, and beyond the steady swell which always rolls off the western shores of Great Britain, the sea was perfectly calm, and both the sea and air promised to be in a very favourable condition for the prosecution of the experiments. When the squadron had reached the appointed rendezvous, a little north of Cape Ortegal, and about 120 miles north-west of the Port of Corunna, the whole of the ships lay to, and soundings were taken, which showed a depth of about 2,530 fathoms, or nearly three statute miles. The result of the soundings having been conveyed by signal to all the ships of the squadron, the *Agamemnon* and *Niagara* were backed close together, stern on, and a strong hawser passed between them to keep them in that situation. The end of the cable was then conveyed by boats from the *Niagara* to the *Agamemnon*, where the splice was safely made. The way in which the splice was made is stated to be effectual in neutralising the evil effects which it was supposed would result from the lay of the two portions of the cable being in opposite directions. A semicircular frame of strong wood was employed, some 15 feet long, and rather broad and thick towards the centre. In this deep grooves were cut, in which the cable was laid, each end passing in at the arms round two eyes in the centre of the crescent, and out at the sides, where the actual joining was made. By this method the strain of the splice was confined entirely to the ends inside the half-moon, while on the actual junction of the cable outside no tension of any kind could come. In order to keep the cable ends in their place around the blocks and within the grooves, a strip of boiler-plate of the same size as the wooden frame was bolted on to it, while to prevent the two portions of the cable untwisting, and to sink it rapidly, a heavy weight was attached to the centre. The splice having been effected, it was lowered overboard, and the two vessels payed out one mile of the experimental cable with the greatest ease. The dynamometer employed was found accurately to register the calculated strain on the cable at different depths. The engineer in charge of the brakes stands facing the graduated scale, and throws off the weights as he sees the vessel lurch and the strain upon the cable rising in proportion while on the contrary, when the dynamometer shows the tension at a low standard, and the cable man

too quickly, the brakes are suffered to close again with ease. It was determined to try the effect of hauling the cable in again from different depths. The hauling-in gear and engine were put in action, and half a mile of the cable recovered with the greatest ease. A further experiment was then determined on, and two miles having been payed out, the wire was allowed to rest for a few minutes, to make sure that the splice went down as far as the length of the cable would let it. A telegraphic message was then conveyed to the *Niagara* to commence hauling up, and both donkey engines were set in motion simultaneously. The enormous weight of the amount of cable out, and its friction on the water equally balanced the power of the *Agamemnon's* donkey engine, and it was only by the aid of handspikes and crowbars that it was kept revolving at all, the strain being two tons five cwt. After about a quarter of a mile of the cable had been reeled in, the weight and friction were sufficiently reduced to give the engine the advantage, and the reeling continued steadily, at the rate of about one mile an hour. During the operation, however, an accident occurred, which brought the wire into contact with the hawser which connected the *Niagara* with the *Agamemnon*, and this was cut through. The *Niagara*, having nothing to hold her, soon drifted away from the *Agamemnon*, and, as a natural consequence parted her end of the cable about half a mile from the splice. The splice, however, was after a time recovered by the hauling gear on board the *Agamemnon*, and the results of its immersion in such extremely deep water were interesting. The frame was penetrated to the very centre by the salt water, from the enormous pressure to which it must have been subjected, which it was calculated could not have been less than 8,000 lbs. to the square inch. Both the wooden frame and the iron rod attached to it were considerably bent and twisted, and showed evident traces of having been turned round with considerable velocity while below the surface. The cable, within some twenty fathoms of the frame, was also much knocked and strained. Various other experiments were made, in the course of which the cable was subjected to very severe strains, which more than once caused it to part. The experiments are, however, stated to have been, on the whole, satisfactory, and though several slight alterations in the machinery and the general arrangements have suggested themselves to the engineers, the new paying-out machine is considered to have fulfilled the most sanguine expectations which were formed of it, only requiring a few trifling alterations in the mechanical adjustments.

SOUTH KENSINGTON MUSEUM.

During the week ending 5th June, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,774; on Monday and Tuesday (free evenings), 3,242. On the three Students' days (admission to the public 6d.), 763; one Students' evening, Wednesday, 96. Total, 6,875.

Proceedings of Institutions.

KANDY (CEYLON).—The committee of the Agri-Horticultural Society, in presenting their report for the year 1857, state that their attention has been much directed to the consideration of the important benefits that would result, not only to Ceylon, but to the home manufacturers, from an extended cultivation of cotton. It is certain that a very large extent of this island is well adapted for the growth of cotton, and there is little doubt that, in some districts, be produced with cultivation. The Cotton Supply Association

it has shown a readiness to assist in the

development of an extensive cotton production, having offered to place at the disposal of this Society ten pounds, as a prize to be given to the producer of ten bales, and upwards, of the best cleaned Kandy grown cotton, equal to American middlings in staple and quality; and a further sum of five pounds to the producer of not less than five bales of similar cotton. They have, moreover, promised to supply suitable seeds, and gins for cleaning the cotton, &c., and to send a number of copies of an excellent treatise, on the best mode of cultivating cotton known in the Southern States of America, and any other additional information it is in their power to communicate. The committee feel that the most effective stimulant to cotton cultivation on an extended scale, would be the giving facilities for the disposal, without much trouble or delay, and at a fair market price, of the cotton produced. To this they will direct the attention of the Cotton Supply Association, assuring them at the same time, that they will use their best endeavours to encourage the cultivation, and by the distribution of seeds &c., to improve the quality of the article produced. Some apparently very good samples of cotton had been exhibited to the Society, and it was hoped that the producers would be able to supply it in sufficient quantity to enable judgment to be formed of its value. The attention of the committee had also been engaged in the consideration of the influence that forests have in keeping up a regular flow of water in streams taking their origin amongst them. A paper on this subject had been laid before the Society. The committee urge upon the members the desirableness of their obtaining, in their several districts, all the reliable information they can procure, as to whether the supply of water in the streams has been affected by the felling of the forests, and whether, and to what extent, the effect, if any, has been counteracted by the subsequent growth of the coffee trees. An interesting collection of dye woods had been exhibited at the last show. Vanillas, of excellent quality, had been sent from the Royal Botanical Gardens, and shown, as well as good samples of tobacco, and an extensive collection of gums, resins, and oils, which were considered of sufficient importance to be entitled to a gold medal. The committee think it desirable not to have an exhibition this year, unless it can be shown to them that a large number of persons are prepared to take some trouble to make it more generally attractive, by bringing fruits and flowers in sufficient number to produce a striking display. The committee trust that when the exhibitions of the Society are renewed, specimens of an improved breed of cattle and of other animals, &c., will be forthcoming, as this is too important a subject, in reference to the best interests of the island, to be neglected. The committee have no doubt that much attention will be shortly given to the subject of fibres, as the government has ordered from England two of Mr. Burke's machines for exhibition in the botanical gardens.

LONDON.—Mr. T. J. Pearsall has been appointed Corresponding Secretary of the London Mechanics' Institution. It is earnestly to be hoped that, with vigorous management within, and the support of its members and students without, a new career of usefulness may be opened for this, the parent Mechanics' Institution of the country, and that the friends of adult education will use every effort in furtherance of so desirable an object. On Wednesday, June 9th, Mr. T. A. Reed gave a lecture on "Speech and its Marvels." The lecturer pointed out the groups of sounds usually uttered to compose human language, and the distinct articulations required even for a single word, showing the wondrous anatomical powers called into requisition. He did not concur in the popular idea that children were a long time learning to speak. On the contrary, he could not but express his surprise that infants so soon mastered the difficulties of speech. Special attention was drawn to the great rapidity with which words could be enunciated, some recent speakers even approaching the rate of 300 words per

minute. Mr. Reed, at a certain point, stated that up to that period, in one hour, more than 8,000 distinct articulations had been made to convey his meaning. The lecture was received with great attention by the audience.

SHEFFIELD.—The last report of the Church of England Educational Institute states that its progress during the past year has been most satisfactory. The highest number of names on the books in any quarter of the year 1856 was 152. In the first quarter of last year the number was 288; in the spring quarter it was 300; and in the winter now closing the number reached 251; a number unparalleled in the experience of the Society. The number of persons who have, during the past year, attended the classes is about 400. The students may be divided, with respect to regularity of attendance, into two portions: 1st, those who constantly attend and steadily apply; and 2nd, those who only come for one or two quarters, who, during that time, attend only one or two of the more entertaining classes, and who show, by their conduct in class, that they come for amusement rather than instruction. The latter portion of the students, undoubtedly, receive much benefit. They get a glimpse of higher subjects; become in some measure sensible of their own ignorance, and are altered, at least, in outward demeanour and general taste. This, however, is not a promising class. It is to the regular, steady, hard-working student that the teacher looks for a display of the advantages of education. In him gradually exhibited correctness of judgment, decision of purpose, habits of perseverance, elevation of morals, enlargement of mind. It will thus be seen that a large number of irregular attendants is not a great advantage, but that the efficiency of such an Institution is chiefly to be measured by the number of constant attendants. The Committee have great pleasure in reporting that a very considerable portion of the students are the latter satisfactory class. Nineteen years is, as it was last year, the average age of the students, while the immense majority continue to be composed of artisans. Several of the senior students have, during the last quarter, undertaken the tuition of junior classes, and the number of such teachers may be expected very considerably to increase. The society possesses the efficient assistance of many masters of the Church of England day schools, while at the same time the staff of teachers has been considerably recruited from other quarters. Many classes have been formed, and in general efficiency the Institute has been much improved since the former year. Several classes have been formed for the study of Trigonometry, of Roman and English History, and the French and Latin Languages; in these and other classes the students recommended by the Society of Arts are used as textbooks. The library continues a source of much interest to the students, more than 2,700 volumes having been taken out during the year. The number of books in the library is steadily increasing, and the thanks of the members are due to the Sheffield Book Club for their generous contributions. The financial position of the Society is equally encouraging with the rest of its proceedings. After discharging all necessary expenses, the annual income presents a most satisfactory surplus, and it is especially gratifying to know that this surplus is a great measure due to the large increase in the contributions by students. In 1856 the increase of contributions from this source amounted to £32, while year after year there was a further increase of £24. The erection of a new building for the purposes of the Institute has become absolutely necessary. The nightly attendance of students is so large, and the number of classes so great, that additional rooms are required for accommodation. On account of the present inconvenient arrangements, the committee cannot invite class lecturers, nor afford the accommodation they desire to the families of annual subscribers.

OVER.—The last report of the Mechanics' Literary, Scientific Institution, states that at the time of its

publication the Institution comprised 194 members. The resources of the Institution have steadily increased, both in the number of its members and the amount of its revenue. From purchases and donations, an addition of no less than 140 volumes had been made to the library during the year. The committee have much pleasure in reporting the continuance and progress of the drawing classes, under the kind and gratuitous superintendence of James Chapman, Esq., assisted by Mr. George Dorrell. The Hon. Secretary, Mr. G. Kershaw, voluntarily conducts the singing class upon the Hullah system, and his efforts appear to be thoroughly appreciated by the members. The Institution had been admitted into union with the Bucks and Berks Lecturers' Association, several of whose members would deliver lectures during the session.

MEETINGS FOR THE ENSUING WEEK.

- MON.** Architects, 8. I. The Discussion on Mr. Burgess' Paper will be resumed. II. Mr. Wyatt Papworth, "Notes on the assumed use of Chestnut Timber in the Carpentry of Old Buildings." Geographical, 8½. I. Messrs. Green, Hahn, and Bath, "Account of an Expedition from Damara Land to the Orampo, in Search of the River Cuenene." II. Lieut. C. A. C. De Crespigny, "Ascent of the River Limbong, Bornoeo." III. Mr. Thomas Hopkins, "On the Fine Regions of the Trade Winds." IV. Mr. J. Turnbull Thomson, "Survey of the Southern Districts of Otago, New Zealand."
- TUES.** Statistical, 8. I. Mr. Welton, "On the Occupations of the People of England and Wales." II. Mr. Willich, "On the Population of England and France." III. Mr. Roberts, "Report on the Congrès de Biochimie at Frankfurt, 1857."
- WED.** Microscopical, 8.
- THURS.** Philocephical Club, 8½.
Antiquaries, 8.
Linnæan, 8.
Chemical, 8. Dr. Hofmann, "On Ammonia."
Philological, 8.
Royal, 8½.
- SAT.** Asiatic, 2.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Parl. No.**
Delivered on 22nd, 27th, and 28th May, 1858.
94. Bills—Public Grounds and Playgrounds.
95. ——— Bishops' Trusts Substitution (No. 2).
Education—Minutes of the Committee of Council.
Sanitary Condition of the Army—Appendix 79.
Delivered on 29th and 31st May, 1858.
- 98 (A 3). Poor Rates and Pauperism—Return (A).
594. Royal Hibernian Academy—Return.
295. Navy (Seamen and Petty Officers)—Return.
296. New Zealand Loan—Return.
Delivered on 1st June, 1858.
276. Vessels and Tonnage, &c.—Return.
291. Poor Relief, &c. (Metropolis)—Return.
Delivered on 2nd June, 1858.
113. Harbours, &c. Bills (19. Clyde Navigation—Supplemental Report from the Board of Trade.
292. Army Clothing, &c.—Returns.
97. Bill—Bishops' Trust Substitution (No. 3).
Delivered on 3rd June, 1858.
270. Bleaching and Dyeing Works—Report from Committee.
297. Westminster New Palace—Copy of Further Correspondence.
302. East India (Letters and Collections, &c.)—Return.
303. East India (Civil Service Examinations)—Copy of Letter.
307. East India—Copy of Letter to the Governor-General.
Delivered on 4th June, 1858.
306. Printing—Copy of Treasury Minutes.
308. Ordnance Survey (Scotland)—Return.
98. Bills—Vaccination (Ireland).
99. ——— Drafts on Bankers' Law Amendment.
Public General Acts—Cap. 17, 18, 19, and 20.
Delivered on 5th and 7th June, 1858.
306. Reformatories—Return.
308. Gilbert-street Calamity—Return.
99. Contracts (Public Departments)—1st Report.
99. Bills (Titles to Land (Scotland)).
101. ——— Marriage Law Amendment (Amended).
102. ——— Nisi Prius Court (Ireland).
100. ——— Insurance Assurance Institutions.
107. ——— Law and Property Amendment.
Delivered on 8th June, 1858.
301. Army (Captain Grant's Kitchens)—Copies of Reports.

Journal of the Society of Arts.

FRIDAY, JUNE 18, 1858.

SEVENTH ANNUAL CONFERENCE.

The Institutions in Union are requested to take notice that the Seventh Annual Conference between the Representatives of the Institutions in Union and the Council, will be held on Thursday next, the 24th of June, at 10 o'clock in the morning. C. Wentworth Dilke, Esq., Chairman of the Council, will preside. Institutions are requested to forward, as soon as possible, to the Secretary of the Society of Arts, the name of the representative appointed to attend the Conference.

The Chairmen of, or Representatives from, the several Local Boards of Examiners, are invited to attend the Conference, as matters connected with the arrangements for the next year's Examinations will, amongst other subjects, be brought under consideration.

ANNUAL DINNER.

The One hundred and fourth Anniversary Dinner of the Society will take place at St. James's Hall, Piccadilly, on Thursday next, the instant, at half past five for six o'clock punctually. Members and their friends are requested to take notice that tickets (price 10s. 6d. each) may now be had at the Society's House. The Hon. the Earl of Carlisle, K.G., will preside.

PROPOSED ECONOMIC MUSEUM.

It may interest some of the Representatives of the Institutions in Union to know that a few sections of this Museum, designed for the instruction and benefit of the working classes, will be exhibited and explained, next week, at the Royal Polytechnic Institution, in Regent-street. One of the chief objects of the collection is to show how Mechanics' Institutions, schools, and other public and private establishments may form analogous collections, in a limited space, and at a moderate expense.

A special Library is attached to the proposed Museum, for the purpose of collecting and diffusing information of every kind on the condition of the industrial population, and the means of improving it. An explanatory notice of the collection may be had on application at the Society of Arts, or to Mr. Freeman, the special curator, at the Polytechnic Institution.

SWINEY LECTURES ON GEOLOGY.

A course of twelve lectures, in connection with the Swiney bequest to the British Museum, is now in the course of delivery at the Museum of Practical Geology, Jermyn-street, on Monday, Tuesday, Wednesday, and Thursday in each week, at 3 o'clock p.m., by Alexander Gordon Melville, M.D., Professor of Natural History in the Queen's University, Ireland.

1. June 14.—Subject-matter of Geology. Classes of Rocks.
2. " 15.—Composition of Rocks. Stratification.
3. " 16.—Igneous Action. Volcanoes, Earthquakes.
4. " 17.—Elevation and Plication of Rocks. Faults.
5. " 21.—Cleavage and Foliation, or
6. " 22.—Denudation. Unconformability.
7. " 23.—Lower Silurian System of Rocks.
8. " 24.—Upper Silurian System of Rocks.
9. " 28.—Devonian System.
10. " 29.—Carboniferous System (Marine Series).
11. " 30.—Carboniferous System (Coal-measures).
12. July 1.—Permian System.

Admission gratis.

EXAMINATIONS, 1858.

PRIZES AWARDED TO CANDIDATES.

Arithmetic ...	1st Prize ...	£5	To No. 29—George William Wicker, aged 18, of the Watt Institute, Portsea (Portsmouth)—A Working Engineer.
	2nd Prize ..	3	" 474—Frederick William Potter, aged 18, of the Crosby-hall Evening Classes, London—Clerk.
Book-keeping	1st Prizes ..	{ 5	" 25—George Harrison, aged 21, of the Young Men's Christian Institute, Leeds—Book-keeper.
	2nd Prizes ..	{ 5	" 37—George Edward Skinner, aged 21, of the Literary Institution, Lynton—Attorney's Clerk.
Algebra	1st Prize ...	5	" 217—James Dawling Bennett, aged 18, of the Royal Polytechnic Institution, London—Gas Engineer.
	2nd Prize ..	4	" 474—Frederick William Potter, aged 18, of the Crosby-hall Evening Classes, London—Clerk.
Geometry ...	1st Prize ...	5	" 29—George William Wicker, aged 18, of the Watt Institute, Portsea (Portsmouth)—A Working Engineer.
	2nd Prize ..	4	" 20—Alfred Pickard, aged 16, of the Young Men's Christian Institute, Leeds—A Mechanic.
Conformation ..	1st Prize ...	5	" 362—Francis Stone Evans, aged 18, of the Athenaeum, Bristol—(Occupation not stated.)
	2nd Prize ..	3	" 16—William Wheeler, aged 17, of the Young Men's Christian Institute, Leeds—Land Surveyor.
Chemical Sections	1st Prize ...	5	" 29—George William Wicker, aged 18, of the Watt Institute, Portsea (Portsmouth)—A Working Engineer.
	1st Prize ...	5	" 362—Francis Stone Evans, aged 18, of the Athenaeum, Bristol.
Chemistry ...	1st Prize ...	5	" 496—George Warrington, aged 17, of the Crosby-hall Evening Classes, London—Worker in a Chemical Laboratory.
	2nd Prize ..	3	" 237—Frederick William Budler, aged 17, Student of the Chemical Class, Royal Polytechnic (London)—A Solicitor's Clerk.

PRIZES AWARDED TO CANDIDATES (CONTINUED).

Botany	1st Prize...	5	„	496—George Warrington, aged 17, of the Crosby-hall Evening Classes, London—Worker in a Chemical Laboratory.
Political Economy	1st Prize...	5	„	485—Robert James White, of the Crosby-hall Evening Classes, London—Clerk.
Geography :-				
Descriptive	1st Prize...	5	„	32—Richard Harper Stretch, aged 20, of the Banbury Mechanics' Institution—Draper.
	2nd Prize...	3	„	53—George Best, aged 24, of the Mechanics' Institution, Leeds—Book-keeper.
Physical...	1st Prize...	5	„	32—Richard Harper Stretch, aged 20, of the Banbury Mechanics' Institution—Draper.
English History	1st Prize...	5	„	53—George Best, aged 24, of the Mechanics' Institution, Leeds—Book-keeper.
	1st Prize	5	„	263—Edward Birks, aged 29, of the People's College, Sheffield—Bank Cashier.
English Literature	2nd Prize...	4	„	258—Joseph Fox, aged 21, of the Mechanics' Institution, Halifax—Timber Merchant.
	3rd Prize...	3	„	265—Joseph Hopkins Davy, aged 31, of the People's College, Sheffield—Grocer.
Latin and Roman History	1st Prize...	5	„	264—William Thomas Hutchinson, of the People's College, Sheffield—Butcher.
Latin	2nd Prize...	3	„	473—James Brady, aged 19, of the Crosby-hall Evening Classes, London—Carpenter.

No Prizes were awarded in Trigonometry; Navigation and Nautical Astronomy; Statics, Dynamics, and Hydrostatics; Practical Mechanics; Magnetism, Electricity and Heat; Astronomy; Animal Physiology; French; German; Free-hand Drawing; and Mechanical or Geometrical Drawing; as no Candidate obtained a First-class Certificate in any of these subjects.

PRIZES AWARDED TO LOCAL BOARDS.

The following prizes are awarded in accordance with the announcement made at page 439 of the *Journal*.

To the Local Board at Crosby Hall Evening Classes, London, one Prize of £10.

To the Local Board at the London Mechanics' Institution, Southampton-buildings, £4.

SPECIAL PRIZES TO INSTITUTIONS.

The Council have awarded a Special Prize of £10 to the Watt Institute, Portsea, the Institution in which Candidate No. 39, George William Wicker, is a Student.

The Council have decided that £5 be awarded to each Institution sending a Candidate that has obtained a First Prize. The following is a List of these Institutions:—

London, Crosby Hall, Evening Classes.....	£15
Portsea, Watt Institute	15
Banbury, Mechanics' Institution	10
Leeds Young Men's Christian Institute	10
Sheffield People's College	10
Bristol Athenæum	5
Leeds Mechanics' Institution	5
Lymington Literary Institution	5

AWARD OF CERTIFICATES.

ARITHMETIC.

FIRST CLASS CERTIFICATES (EXCELLENCE).

Candidates
Numbers.

- 22—Joseph Hough, aged 20, Young Men's Christian Institute, Leeds—A Mechanic.
- 25—George Harrison, aged 21, Young Men's Christian Institute, Leeds—Book-keeper.
- 29—George William Wicker, Watt Institute, Portsea—Engineer.
- 56—John Charles Froyne, aged 23, Mechanics' Institute, Pembroke Dock—Shipwright.
- 94—James Mills, junr., aged 20, Mechanics' Institution, Bradford—Warehouseman.
- 217—James Dawling Bennett, aged 18, Royal Polytechnic, London—Gas Engineer.
- 228—Samuel Dean Grimson, aged 16, Royal Polytechnic, London.
- 235—Daniel Charles Carmichael, aged 21, the Institute, Liverpool—Book-keeper.
- 336—John Stamford Walton, junr., aged 19, Mechanics' Institution, Northallerton.
- 341—Henry Irwin Jenkinson, Institute of Popular Science and Literature, York—Clerk.
- 362—Francis Stone Evans, aged 18, the Athenæum, Bristol.
- 468—John Joseph Goldsmith, aged 19, Crosby-hall Evening Classes, London—Architect's Clerk.
- 474—Frederick William Potter, Crosby Hall Evening Classes, London—Clerk.
- 485—Richard George Frost, Crosby-hall Evening Classes, London—Clerk.
- 497—John Cocking Fielden, aged 20, Literary, Scientific, and Mechanics' Institute, Blackburn—Book-keeper.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 6—William Dean, aged 20, Mechanics' Institution, Wigan—Clerk.
 9—James Platt, aged 20, Mechanics' Institution, Wigan—Lawyer's Clerk.
 15—Thomas Myers, aged 19, Young Men's Christian Institute, Leeds—Railway Clerk.
 20—Alfred Rickard, aged 16, Young Men's Christian Institute, Leeds—A Mechanic.
 37—George Edward Skinner, aged 21, Literary Institution, Lymington—Attorney's Clerk.
 41—John J. Chapman, aged 16, Literary and Mutual Improvement Society, West Brompton (London)—Clerk.
 48—William Sterne, aged 20, Mechanics' Institution, Holbeck—A Mechanic.
 54—Charles Thomas Barnes, aged 16, Mechanics' Institution, Leeds—Clerk.
 67—James Dickie, aged 19, Mechanics' Institution, London—Clerk.
 77—Thomas Hammond Harper, aged 16, Mechanics' Institution, Selby—Grocer.
 78—Thomas Bedford, aged 28, Mechanics' Institution, Selby—Schoolmaster.
 87—John Clark Wise, aged 17, Mechanics' Institution, Bradford—Woolsorter.
 112—John Lowe, aged 21, Mechanics' Institution, Manchester—Turner.
 230—Alfred Holloway, aged 18, Royal Polytechnic, London—Clerk.
 248—John Leach, aged 16, Mechanics' Institution, Halifax—Clerk.
 256—William Henry Boocock, aged 20, Mechanics' Institution, Halifax—Solicitor's Clerk.
 262—Richard Shutt, aged 35, People's College, Sheffield—Saddler.
 268—Thomas Dresser, aged 24, People's College, Sheffield—Post-office Clerk.
 299—Thomas Wiltshire Brooke, aged 16, Coll. Institute, Liverpool—
 300—Joseph Plair, aged 19, Coll. Institute, Liverpool—Clerk.
 314—John Brammer, aged 16, Mechanics' Institution, Lockwood—Clothdresser.
 332—Richard Cockroft, aged 18, Working Man's College, Haley-hill, Halifax—Warehouseman.
 338—Thomas Henry Sowden, aged 17, Institute of Popular Science and Literature, York—Railway Clerk.
 345—Alfred Prudames, aged 20, Mechanics' Institution, Berkhamstead—Veterinary Surgeon.
 347—William Henry Abbey, aged 18, Mechanics' Institution, Berkhamstead—Clerk.
 348—Anthony Slater, aged 18, Mechanics' Institution, Berkhamstead—Printer.
 467—Robert Corney Harrison, aged 22, Crosby Hall Evening Classes, London—Clerk.
 498—James Hodgson, aged 16, Literary, Scientific, and Mechanics' Institution, Blackburn—Plasterer.
 492—Edwin Eccles Manning, aged 16, Society for the Acquisition and Diffusion of Useful Knowledge, Greenwich—Clerk.
 493—Edwin Slowman Rous, aged 19, Improvement Association, Lewes—School Teacher.
 502—Charles Arthur Hardwick, aged 16, Brighton.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 11—John Allison Zachariah, aged 23, M. and Lit. Inst., West Hartlepool—Watchmaker.
 12—Thomas Pearson Tate, aged 21, West Hartlepool Literary and Mechanics' Institution—Clerk.
 26—John William Dixon, aged 19, Young Men's Christian Institute, Leeds—Printer.
 28—Samuel Woodhead, aged 31, Mechanics' Institution, Northowram—Book-keeper.
 30—Thomas William Smith, aged 19, Watt Institute, Portsea—Engineer.
 40—Robert Freestons, aged 20, Lit. and M. I. Inst., West Brompton—Clerk.
 43—Henry Logan, aged 17, M. I., Wakefield—Iron Moulder.
 45—Joseph Albert Dear, Mechanics' Institution, Wakefield—Draper.
 49—Joseph Staincliffe, aged 26, M.I., Leeds—Letter Carrier.
 57—William Clark, aged 32, M. I., Pembroke Dock—Shipwright.
 59—John Mumford, aged 19, Mechanics' Institute, Pembroke Dock—Shipwright's Apprentice.
 61—Thomas Wood Chapman, Mechanics' Institution, Ipswich—Clerk of Inland Revenue.
 64—Robert Searlett, aged 21, M. I., Ipswich—Clerk.
 83—Benjamin Raby, jun., aged 19, M.I., Bradford—A Mechanic.
 84—Alfred Liversedge, aged 17, Mechanics' Institute, Bradford—Warehouseman.
 86—Richard Moore, aged 18, M. I., Bradford—Music Seller.
 114—Henry Varley, aged 25, M. I., Manchester—Porter.
 118—Samuel Davies, aged 28, Mechanics' Inst., Manchester—Clerk.
 192—James Barber, aged 19, Society for the Acquisition of Useful Knowledge, Macclesfield—Assistant Master of Workhouse.
 227—Henry Turner Gale, aged 20, Royal Polytechnic, London—Ironmonger.
 238—Walter Snell, aged 19, Royal Polytechnic, London—Surveyor.
 240—George Alfred Tillett, aged 19, Royal Polytechnic, London—Clerk.
 261—William Taylor, aged 21, M. I., Milns Bridge (Yorks.)—Spinner.
 274—Walter James Hepworth, aged 17, People's College, Sheffield—Clerk.
 288—Conyers Kirby, aged 20, The Institute, Liverpool—Surveyor and Draughtsman.
 292—John Laurie, aged 16, Coll. Inst., Liverpool.
 294—Richard Daniel Petterson, aged 16, Coll. Inst., Liverpool—Clerk.
 296—Samuel Cross, aged 16, Coll. Inst., Liverpool—Clerk.
 302—William Parry, aged 21, Collegiate Institute, Liverpool—Clerk.
 308—Richard Owens, aged 26, Coll. Inst., Liverpool—Joiner.
 311—Thomas Eccleston Gibb, aged 19, Collegiate Institute, Liverpool—Brushmaker.
 317—William Birkbeck, aged 20, Working Man's College, Halifax—Warehouseman.
 319—James Spencer, aged 24, Working Man's College, Halifax—Porter.
 326—Thomas Findar, aged 22, Working Man's College, Halifax—Overlooker.
 327—Edward Cockroft, aged 20, Working Men's College, Halifax—Stover.
 331—James Carr Norcliffe, aged 24, Working Man's Coll., Halifax—Weaver.
 344—David George Pearce, aged 21, M.I., Berkhamstead—Shovel Maker.
 346—Eber Charles Jones, aged 18, Mechanics' Institution, Berkhamstead—Clerk.

- 351—William Albert Skinner, aged 18, Mechanics' Institute, Berhampstead—Bricklayer.
 469—John Fretwell, aged 20, Crosby-hall, London—Clerk.
 478—Edward Highton, aged 20, Crosby-hall, London—Clerk.
 486—Henry Sharp, aged 23, Lit. Sci., and M. I., Windsor—Painter.

BOOK-KEEPING.

FIRST CLASS CERTIFICATES (EXCELLENCE).

- 25—George Harrison, aged 21, Young Men's Christian Institute, Leeds—Book-keeper.
 37—George Edward Skinner, aged 21, Lit. Inst., Lymington—Attorney's Clerk.
 67—James Dickie, aged 19, London Mechanics' Institution—Clerk.
 72—William Walton Snelling, aged 21, London Mechanics' Institution—Clerk.
 206—Edwin James Kelly, aged 17, Useful Knowledge Society, Macclesfield.
 217—James Dawling Bennett, aged 18, Royal Polytechnic, London—Gas Engineer.
 248—John Leech, aged 16, M. I. Halifax—Clerk.
 260—David Baxter, aged 21, M. I., Mossley (York.)—Card-room hand.
 290—Wilfred Johanning, aged 16, Coll. Inst., Liverpool—Clerk.
 317—William Birkbeck, aged 20, Working Man's College, Halifax—Warehousman.
 336—John Stamford Walton, aged 19, M. I., Northallerton.
 467—Robert Corney Harrison, aged 22, Crosby Hall, London—Clerk.
 468—John Joseph Goldsmith, aged 19, Crosby Hall, London—Clerk.
 474—Frederick William Potter, aged 18, Crosby Hall, London—Clerk.
 492—Edward Eccles Manning, Society D. U. K., Greenwich—Clerk.
 500—George Wood, aged 22, Crosby Hall, London—Clerk.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 61—Thomas Wood Chapman, aged 28, M. I., Ipswich—Clerk Inland Revenue.
 64—Robert Scarlett, aged 21, M. I., Ipswich—Clerk.
 118—Samuel Davies, aged 28, M. I., Manchester—Clerk.
 122—John Pogson, aged 26, M. I., Manchester—Clerk.
 267—Carter Lenthall, aged 31, People's College, Sheffield—Warehousman.
 295—Daniel Charles Carmichael, aged 21, Coll. Inst., Liverpool—Book-keeper.
 337—James Finis Mennell, aged 22, Inst., York—Confectioner.
 437—John Cocking Fielden, aged 20, L.S. and M. I., Blackburn—Book-keeper.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 12—Thomas Pearson Tate, aged 21, L. and M.I., West Hartlepool—Clerk.
 28—Samuel Woodhead, aged 31, M.I., Northowram—Book-keeper.
 52—James Denton, aged 24, M.I., Leeds—Mason.
 53—George Best, aged 24, M.I., Leeds—Book-keeper.
 230—Alfred Holloway, aged 19, Royal Polytechnic, London—Clerk.
 259—Joseph Howard, aged 22, M.I., Mossley—Drapers' Assistant.
 340—John Robertson, aged 25, M.I., York—Porter.

ALGEBRA.

FIRST CLASS CERTIFICATES (EXCELLENCE).

- 20—Alfred Pickard, aged 16, Young Men's Christian Inst., Leeds—A Mechanic.
 29—George William Wicker, aged 18, Watt Inst., Portsea—Engineer.
 362—Francis Stone Evans, aged 18, Athenæum, Bristol.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 56—John Charles Froyne, aged 23, M.I., Pembroke Dock—Shipwright.
 73—Daniel Leggatt, aged 30, London Mechanics' Institution—Law Clerk.
 94—James Mills, junr., aged 20, M.I., Bradford—Warehousman.
 121—Talbot Hamilton, aged 17, M.I., Manchester—Engineer.
 233—Conyers Kirby, aged 20, Coll. Inst., Liverpool—Surveyor.
 474—Frederick William Potter, aged 18, Crosby-hall, London—Clerk.
 501—Arthur James Atkinson, aged 18, R. Lit. and Sci. Inst., Brighton.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 41—John Joseph Chapman, aged 16, Lit. and Mutual M. Inst., West Brompton—Clerk.
 45—Joseph Albert Dear, aged 17, M.I., Wakefield—Draper.
 49—William Sterne, aged 20, M.I., Holbeck—A Mechanic.
 98—John Laycock, junr., aged 29, M.I., Bradford—Schoolmaster.
 122—John Pogson, aged 26, M.I., Manchester—Clerk.
 228—Samuel Dean Grimson, aged 17, Royal Polytechnic, London.
 232—George Lander, aged 21, M.I., Glasgow—Mechanical Engineer.
 317—William Birkbeck, aged 20, Working Man's Coll., Halifax—Warehousman.
 332—Richard Cockroft, aged 18, Working Man's Coll., Halifax—Warehousman.
 334—Henry Smith, aged 17, Working Man's Coll., Halifax—Finisher.
 485—Richard George Frost, aged 21, Crosby-hall, London—Clerk.

GEOMETRY.

FIRST CLASS CERTIFICATE (EXCELLENCE.).

16—William Wheeler, aged 17, Young Men's Christ. Inst.—Land Surveyor.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

29—George William Wicker, aged 18, Watt Institute, Portsea—Engineer.
 30—Thomas William Smith, aged 19, Watt Institute, Portsea—Engineer.
 132—John Pogson, aged 26, M. I., Manchester—Clerk.
 341—Henry Irwin Jenkinson, aged 19, Inst., York—Clerk.
 362—Francis Stone Evans, Athenæum, Bristol.

THIRD CLASS CERTIFICATES (COMPETENCY.)

20—Alfred Pickard, aged 16, Young Men's Christian Inst., Leeds—A Mechanic.
 94—James Mills, jun., aged 20, M. I., Bradford—Warehouseman.
 110—Arthur Ashworth, aged 18, M. I., Manchester—Mechanic.
 206—Edwin James Kelly, aged 17, Useful Knowledge Soc.—Macclesfield.
 472—Thomas Roberts, aged 20, Crosby-hall, London—Printer.

MENSURATION.

FIRST CLASS CERTIFICATE (EXCELLENCE.).

29—George William Wicker, aged 18, Watt Institute, Portsea—Engineer.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

20—Alfred Pickard, aged 16, Young Men's Christian Inst., Leeds—Mechanic.
 22—Joseph Hough, aged 20, Young Men's Christian Inst., Leeds—Mechanic.
 56—John Charles Froyne, aged 23, M. I., Pembroke Dock—Shipwright.
 94—James Mills, junr., aged 20, M. I., Bradford—Warehouseman.
 110—Arthur Ashworth, aged 18, M. I., Manchester—Mechanic.
 111—Alfred Wadsworth, aged 16, M. I., Manchester—Engineer.
 472—Thomas Roberts, aged 20, Crosby Hall, London—Printer.
 474—Frederick William Potter, aged 18, Crosby Hall, London—Clerk.

THIRD CLASS CERTIFICATES (COMPETENCY.)

5—Robert Leyland, aged 24, M.I., Wigan—Chain-maker.
 28—Samuel Woodhead, aged 31, M. I., Northowram—Book-keeper.
 30—Thomas William Smith, aged 19, Watt Institute, Portsea—Engineer.
 43—Henry Logan, aged 17, M.I., Wakefield—Iron Moulder.
 57—William Clark, aged 32, M.I., Pembroke Dock—Shipwright.
 78—Thomas Bedford, aged 28, M.I., Selby, Schoolmaster.
 132—John Pogson, aged 26, M.I., Manchester—Clerk.
 227—Henry Turner Gale, aged 20, Royal Polytechnic, London—Ironmenger.
 240—George Alfred Tillet, aged 19, Royal Polytechnic, London—Clerk.
 282—George Lauder, aged 21, M.I., Glasgow—Mechanical Engineer.
 303—Richard Owens, aged 26, Coll. Inst., Liverpool—Joiner.
 478—Edward Highton, aged 20, Crosby Hall, London—Clerk.
 487—John Cocking Fielden, aged 20, L.S. and M.Inst., Blackburn—Book-keeper.

TRIGONOMETRY.

FIRST CLASS CERTIFICATES (EXCELLENCE.).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

20—Alfred Pickard, aged 16, Young Mens Christian Inst., Leeds—A Mechanic.
 30—Thomas William Smith, aged 19, Watt Inst., Portsea—Engineer.
 56—John Charles Froyne, aged 23, M. I., Pembroke Dock—Shipwright.
 94—James Mills, junr., aged 20, M.I. Bradford—Warehouseman.
 362—Francis Stone Evans, aged 18, Athenæum, Bristol.

THIRD CLASS CERTIFICATES (COMPETENCY.)

29—George William Wicker, aged 18, Watt Inst., Portsea—Engineer.
 283—Conyers Kirby, aged 20, Coll. Inst., Liverpool—Surveyor.
 341—Henry Irwin Jenkinson, aged 19, Inst. Pep. Sci., &c., York—Clerk.

CONIC SECTIONS.

FIRST CLASS CERTIFICATE (EXCELLENCE.).

362—Francis Stone Evans, aged 18, Athenæum, Bristol.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

20—Alfred Pickard, aged 16, Young Men's Christian Inst., Leeds—A Mechanic.
 22—Joseph Hough, aged 20, Young Men's Christian Inst., Leeds—A Mechanic.
 472—Thomas Roberts, aged 20, Crosby Hall, London—Printer.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 56—John Charles Froyne, aged 23, M. I., Pembroke Dock—Shipwright.
 94—James Mills, jun., aged 20, M. I., Bradford—Warehouseman.
 283—Conyers Kirby, aged 20, Collegiate Inst., Liverpool—Surveyor.

NAVIGATION AND NAUTICAL ASTRONOMY.

FIRST CLASS CERTIFICATES (EXCELLENCE).

(None.)

SECOND CLASS CERTIFICATES (PROFICIENCY).

(None.)

THIRD CLASS CERTIFICATE (COMPETENCY).

- 23—Joseph Hough, aged 20, Young Men's Christ. Inst., Leeds—A Mechanic.

STATICS, DYNAMICS, AND HYDROSTATICS.

FIRST CLASS CERTIFICATES (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 29—George William Wicker, aged 18, Watt Inst., Portsea—Engineer.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 22—Joseph Hough, aged 20, Young Men's Christian Inst., Leeds—A Mechanic.
 30—Thomas William Smith, aged 19, Watt Institute, Portsea—Engineer.
 56—John Charles Froyne, aged 23, M.I. Pembroke Dock—Shipwright.
 94—James Mills, junr., aged 20, M.I., Bradford—Warehouseman.
 128—Edward Jacob, aged 18, M.I., Manchester—Engineer.
 249—Joseph James Coleman, aged 19, M.I., Halifax—Chemist and Druggist.
 282—George Lauder, aged 21, M.I., Glasgow—Mechanical Engineer.
 336—John Stamford Walton, aged 19, M.I., Northallerton.

PRACTICAL MECHANICS.

FIRST CLASS CERTIFICATES (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 29—George William Wicker, aged 18, Watt Institute, Portsea—Engineer.
 36—Conrad Horz, aged 19, Church of England Institute, Newcastle-on-Tyne—Gentleman's Servant.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 18—Richard Henry Butterworth, aged 18, Young Men's Christian Inst., Leeds—A Mechanic.
 336—John Stamford Walton, junr., aged 19, M.I., Northallerton.

MAGNETISM, ELECTRICITY, AND HEAT.

FIRST CLASS CERTIFICATES (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 232—Francis Henry Keeble, aged 18, R. Polytechnic, London—Marqueterie Cutter.
 249—Joseph James Coleman, aged 19, M.I. Halifax—Chemist and Druggist.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 336—John Stamford Walton, junr., aged 19, M.I. Northallerton.

ASTRONOMY.

FIRST CLASS CERTIFICATES (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 20—Alfred Pickard, aged 16, Young Men's Christian Institute, Leeds—A Mechanic.
 22—Joseph Hough, aged 20, Young Men's Christian Institute, Leeds—A Mechanic.
 56—John Charles Froyne, aged 23, M.I. Pembroke Dock—Shipwright.

THIRD CLASS CERTIFICATES (COMPETENCY).

None.

CHEMISTRY.

FIRST CLASS CERTIFICATES (EXCELLENCE.)

- 237—Frederick William Rudler, aged 17, R. Polytechnic, London—Clerk.
 496—George Warrington, aged 17, Crosby-hall, London—Works in a chemical laboratory.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

- 66—Thomas Shinn, aged 16, London Mechanics' Inst.—Clerk.
 320—William Carr Hebden, aged 18, Working Man's Coll. Halifax—Chemist and Druggist.

THIRD CLASS CERTIFICATES (COMPETENCY.)

- 2—John Parkinson Atkinson, aged 19, M.I., Louth—Chemist and Druggist.
 3—John Burgess, aged 19, M.I., Louth—Printer.
 128—Edward Jacob, aged 18, M.I., Manchester—Engineer.
 232—Francis Henry Keeble, aged 18, Royal Polytechnic—Marqueterie Cutter.
 247—John Morton Barbour, aged 27, M.I., Halifax—Clerk.
 269—William Collier, aged 16, People's College, Sheffield—Chemist and Druggist.

ANIMAL PHYSIOLOGY.

FIRST CLASS CERTIFICATES (EXCELLENCE.)

(None.)

SECOND CLASS CERTIFICATES (PROFICIENCY.)

- 14—Oswald Brigg, aged 21, Young Men's Christian Inst., Leeds—Clerk.
 249—Joseph James Coleman, aged 19, M. I., Halifax—Chemist and Druggist.

THIRD CLASS CERTIFICATE (COMPETENCY.)

(None.)

BOTANY.

FIRST CLASS CERTIFICATE (EXCELLENCE.)

- 496—George Warrington, aged 17, Crosby Hall, London—Worker in a chemical laboratory.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

(None.)

THIRD CLASS CERTIFICATE (COMPETENCY.)

- 263—Edward Birks, aged 29, People's Coll., Sheffield—Bank Cashier.

POLITICAL AND SOCIAL ECONOMY.

FIRST CLASS CERTIFICATES (EXCELLENCE.)

- 483—Robert James White, aged 20, Crosby-hall, London—Clerk.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

None.

THIRD CLASS CERTIFICATE (COMPETENCY.)

- 487—John Cocking Fielden, aged 20, L.S. and M.I., Blackburn—Book-keeper.

DESCRIPTIVE GEOGRAPHY.

FIRST CLASS CERTIFICATES (EXCELLENCE.)

- 32—Richard Harper Stretch, aged 20, M.I., Banbury—Draper.
 53—George Best, aged 24, M.I., Leeds—Book-keeper.
 67—James Dickie, aged 19, London Mech. Inst.—Clerk.
 72—William Walton Snelling, aged 21, London Mech. Inst.—Clerk.
 311—Thomas Eccleston Gibb, aged 19, Coll. Inst., Liverpool—Brushmaker.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

- 12—Thomas Pearson Tate, aged 21, L. and M.I., West Hartlepool—Clerk.
 31—Joseph Flashman, aged 18, Athenæum, Warminster—Auctioneer.
 33—Thomas Lamb, aged 22, M. I., Banbury—Confectioner.
 39—Walter Wellsman, aged 24, Lit. and Mutual Improvement Inst., West Brompton—Clerk.
 50—Linley Oldroyd, aged 16, M.I., Leeds.
 58—Joseph Evans, aged 27, M.I., Pembroke Dock—Shipwright.
 90—Joseph Harrison, aged 16, M.I., Bradford—Warehouse Boy.
 235—James Purrott, aged 23, R. Polytechnic, London—Clerk.
 335—John Holmes, aged 31, Working Man's College, Halifax—Finisher.
 493—Edwin Sloman Rous, aged 19, Improvement Inst., Lewes—School-teacher.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 8—Kenneth Mackenzie, aged 16, M.I., Wigan—Mining Engineer.
 9—James Platt, aged 20, M.I., Wigan—Lawyer's Clerk.
 35—John Stanger, aged 27, Church of England Inst., Newcastle-on-Tyne—Butler.
 51—Matthew Graham, aged 18, M.I., Settle—Joiner.
 59—John Mumford, aged 19, M.I., Pembroke Dock, Shipwright.
 132—Edwin Sloper, aged 17, Literary Inst., Salisbury—Bank Cashier.
 365—Thomas Harper Heald, aged 32, London Domestic Mission, Cripplegate—House Decorator.
 486—Henry Sharp, aged 23, Lit. Sci. and M.I., Windsor—Painter.

PHYSICAL GEOGRAPHY INCLUDING GEOLOGY.

(FIRST CLASS CERTIFICATE (EXCELLENCE).)

- 33—Richard Harper Stretch, aged 20, M.I., Banbury—Draper.

SECOND CLASS CERTIFICATES (PROFICIENCY.)

- 12—Thomas Pearson Tate, aged 21, Lit. and M.I., West Hartlepool—Clerk.
 33—Thomas Lamb, aged 22, M.I., Banbury—Confectioner.
 39—Walter Wellsman, aged 24, Lit. and Mutual Improvement Assoc. West Brompton—Clerk.
 90—Joseph Harrison, aged 16, M.I. Bradford—Warehouseman.
 311—Thomas Eccleston Gibb, aged 19, Coll. Inst., Liverpool—Brushmaker.

THIRD CLASS CERTIFICATES (COMPETENCY.)

- 35—John Stanger, aged 27, Church of England Institute, Newcastle-on-Tyne—Butler.
 132—Edwin Sloper, aged 17, Lit. Inst., Salisbury—Bank Cashier.
 365—Thomas Harper Heald, aged 32, London Domestic Mission, Cripplegate—House Decorator.
 493—Edwin Slowman Rous, aged 19, Improvement Inst., Lewes—School Teacher.

ENGLISH HISTORY.

FIRST CLASS CERTIFICATE (EXCELLENCE).

- 53—George Best, aged 24, M. I., Leeds—Book-keeper.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 37—George Edward Skinner, aged 21, Lit. Inst., Lymington—Attorney's Clerk.
 55—William Knapton, aged 29, M. I., Leeds—Mason.
 64—Robert Scarlett, aged 21, M. I., Ipswich—Clerk.
 88—Joseph Seed Roberts, aged 17, M. I., Bradford—Cabinet Maker.
 89—William Hay, aged 17, M. I., Bradford—Printer.
 252—William T. Dewhirst, aged 16, M. I., Halifax—Telegraph Clerk.
 311—Thomas Eccleston Gibb, aged 19, Coll. Inst., Liverpool—Brush Maker.
 319—James Spencer, aged 24, Working Man's Coll., Halifax—Porter.
 365—Thomas Harper Heald, aged 32, London Domestic Mission, Cripplegate—House Decorator.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 1—William Williams, aged 20, M. I., Louth—
 4—John Roney, aged 16, M. I., Louth—Attorney's Clerk.
 8—Kenneth Mackenzie, aged 16, M. I., Wigan—Mining Engineer.
 50—Linley Oldroyd, aged 16, M. I., Leeds—
 261—William Taylor, aged 21, M.I., Milnes-bridge—Spinner.
 268—Thomas Dresser, age 24, People's Coll. Sheffield—Post-office Clerk.
 318—John Walker, aged 18, Working Man's College, Halifax—Woollen Spinner.
 335—John Hollinrake, aged 19, Working Man's College, Halifax—Carder.
 476—James David Gellen, aged 18, Crosby-hall, London—Clerk.
 486—Henry Sharp, aged 23, Lit. Sci. and M.I., Windsor—Painter.

ENGLISH LITERATURE.

FIRST CLASS CERTIFICATES (EXCELLENCE).

- 258—Joseph Fox, aged 21, M.I., Halifax—Timber Merchant.
 263—Edward Birks, aged 29, People's Coll., Sheffield—Bank Cashier.
 265—Joshua Hopkins Davy, aged 31, People's Coll., Sheffield—Grocer.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 17—William Henry Tetley, aged 19, Young Men's Christian Inst., Leeds—Bookseller.
 60—Henry Best, aged 20, M.I., Ipswich—Clerk.
 69—Francis Lynch, aged 21, London Mechanics' Institution—Compositor and Reader.
 92—William Harrison, aged 19, M.I., Bradford—Compositor.
 259—Joseph Howard, aged 22, M.I., Mossley—Draper's Assistant.

THIRD CLASS CERTIFICATES. (COMPETENCY.)

- 21—Charles Robinson, aged 21, Young Men's Christian Inst., Leeds—Warehouseman.
 23—Charles Cowell, aged 18, Young Men's Christian Inst., Leeds—Compositor.
 25—George Harrison, aged 21, Young Men's Christian Inst., Leeds—Book-keeper.
 54—Charles Thomas Barnes, aged 16, M.I., Leeds—Clerk.
 61—Thomas Wood Chapman, aged 28, M.I., Ipswich—Clerk, Inland Revenue.
 63—Gordon Dothie, aged 19, M.I., Ipswich—Tobacconist.
 228—Samuel Dean Grimson, aged 17, Royal Polytechnic.
 266—John Lister, aged 29, People's College, Sheffield—Butcher.
 291—Malcolm Guthrie, aged 21, Coll. Inst., Liverpool—Book-keeper.
 319—James Spencer, aged 24, Working Man's College, Halifax—Porter.
 335—John Holmes, aged 31, Working Man's College, Halifax—Finisher.
 467—John Cocking Fielden, aged 23, L. S., and M.I., Blackburn—Book-keeper.

LATIN AND ROMAN HISTORY.

FIRST CLASS CERTIFICATE (EXCELLENCE).

- 264—William Thomas Hutchinson, aged 28, People's Coll., Sheffield—Butcher.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 60—Henry Best, aged 20, M.I., Ipswich—Clerk.
 472—Thomas Roberts, aged 20, Crosby-hall, London—Printer.

THIRD CLASS CERTIFICATE (COMPETENCY).

- 501—Arthur James Atkinson, aged 18, R. Lit. and Sci. Inst., Brighton.

LATIN (ALONE).

FIRST CLASS CERTIFICATE (EXCELLENCE).

- 473—James Brady, aged 19, Crosby-hall, London—Carpenter.

SECOND CLASS CERTIFICATE (COMPETENCY).

- 69—Francis Lynch, aged 21, London Mech. Inst.—Compositor and Reader.

FRENCH.

FIRST CLASS CERTIFICATE (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

- 54—Charles Thomas Barnes, aged 16, M.I., Leeds—Clerk.
 67—James Dickie, aged 19, London Mechanics' Institution—Clerk.
 91—William Wilcock, aged 25, M.I., Bradford—Clerk.
 244—Richard McCully, aged 27, Messrs. Chances' Reading-room, &c., Birmingham—Clerk.
 250—William Henry Knowles, aged 27, M.I., Halifax—Card Maker.
 283—Conyers Kirby, aged 20, Coll. Inst., Liverpool—Surveyor.
 353—Eliza Hall, aged 28, Athenæum, Bristol.
 355—Elizabeth McArthur, aged 18, Athenæum, Bristol.
 362—Francis Stone Evans, aged 18, Athenæum, Bristol.
 501—Arthur James Atkinson, aged 18, R. Lit. and Scientific Inst., Brighton.

THIRD CLASS CERTIFICATES (COMPETENCY).

- 18—Richard Henry Butterworth, aged 18, Young Men's Christian Institute, Leeds—A Mechanic.
 37—George Edward Skinner, aged 21, Literary Institution, Lymington—Attorney's Clerk.
 69—Francis Lynch, aged 21, London Mechanics' Institution—Compositor and Reader.
 106—Maurice Bibby, aged 20, M.I. Manchester—Clerk.
 194—Sarah Ellen Lean, aged 37, M.I. Macclesfield—Governess.
 228—Samuel Dean Grimson, aged 17, R. Polytechnic, London.
 242—Walter Coates, aged 23, R. Polytechnic, London—Clerk.
 267—Carter Lenthall, aged 31, People's College, Sheffield—Warehouseman.
 356—Alice Davies, aged 18, Athenæum, Bristol.
 357—John Morris Harris, aged 19, Athenæum, Bristol—Clerk.
 358—Margaret Lydia Lovell, aged 17, Athenæum, Bristol.
 479—Edward Phillip Plowman, aged 18, Crosby Hall, London—Clerk.
 481—John Sharland Dyer, aged 21, Crosby Hall, London—Draper.
 497—William Gilmore Reid, aged 28, Crosby Hall, London—Compositor.
 498—Henry Legg, aged 21, Crosby Hall, London—Butcher.
 500—George Wood, aged 32, Crosby Hall, London—Clerk.

GERMAN.

FIRST CLASS CERTIFICATES (EXCELLENCE).

None.

SECOND CLASS CERTIFICATES (PROFICIENCY).

52—James Denton, aged 26, M.I., Leeds—Mason.

THIRD CLASS CERTIFICATES (COMPETENCY).

42—Joseph Parker Marriott, aged 20, M.I., Wakefield—Overlooker.

118—Samuel Davies, aged 28, M.I., Manchester—Clerk.

244—Richard McCully, aged 27, Messrs. Chances' Reading Room, &c., Birmingham—Clerk.

471—James Brignall, aged 25, Crosby Hall, London—Accountant.

FREE-HAND DRAWING.

FIRST CLASS CERTIFICATES. (EXCELLENCE.)

(None.)

SECOND CLASS CERTIFICATES (PROFICIENCY).

95—John Sowden, aged 19, M.I., Bradford—Builder.

98—William Henry Spurr, aged 20, M.I., Bradford—Cabinet-maker.

99—Abner Rhodes, aged 22, M.I., Bradford—Mason.

229—Alfred Healey, aged 19, Royal Polytechnic—Joiner.

280—Edwin Guthrie, aged 16, Coll. Inst., Liverpool—Clerk.

361—James Craik, aged 17, Athenæum, Bristol—Surveyor.

363—Thomas Henry Yabicorn, aged 16, Athenæum, Bristol.

364—William Milthorpe Arundale, aged 16, M.I., Bradford, Engtraver.

THIRD CLASS CERTIFICATES (COMPETENCY.)

31—Joseph Flashman, aged 18, Athenæum, Warminster—Auctioneer.

34—William Tate Wilson, aged 20, Church of England Inst., Newcastle-upon-Tyne—Painter and glazier.

74—John Denby Cuttle, aged 35, M.I., Selby—Schoolmaster.

96—George Andrew Jones, aged 19, M.I., Bradford—Warehouseman.

97—James Cooper, aged 22, M. I., Bradford—In a Warehouse.

191—Marshall McKnight, aged 18, U. K. Society, Macclesfield—Clerk.

206—Edwin James Kelly, aged 17, U. K. Society, Macclesfield.

224—William Edwards, aged 17, Royal Polytechnic, London—Joiner.

227—Henry Turner Gale, aged 20, Royal Polytechnic, London—Ironmonger.

304—William Pownall Green, aged 16, Coll. Inst., Liverpool—

MECHANICAL OR GEOMETRICAL DRAWING.

FIRST CLASS CERTIFICATES (EXCELLENCE.)

(None.)

SECOND CLASS CERTIFICATES (PROFICIENCY.)

110—Arthur Ashworth, aged 18, M.I., Manchester—A Mechanic.

293—Robert Gordon, aged 17, Coll. Inst., Liverpool—Millwright.

THIRD CLASS CERTIFICATES (COMPETENCY.)

10—John Barnard Stevens, aged 26, M.I., Wigan—Mechanical Draughtsman.

95—John Sowden, aged 19, M.I., Bradford—Builder.

103—Charles George Chapman, aged 18, M.I., Manchester—Engineer.

111—Alfred Wadsworth, aged 16, M.I., Manchester—Engineer.

282—George Lauder, aged 21, M.I., Glasgow—Mechanical Engineer.

303—Richard Owens, aged 26, Coll. Inst., Liverpool—Joiner.

BRITISH HONDURAS.

(Concluded from page 471.)

Mr. Buchanan says, with reference to the treaty of 1786, "so far from this treaty being put an end to by the war, its continued existence in 1817 and 1819 was recognised by acts of the British Parliament. These declare in so many words that "Belize" was not within the territory and dominions of his Majesty, "but was merely a settlement for certain purposes in the possession and under the protection of his Majesty."

It is true that the statutes referred to by Mr. Buchanan are somewhat cautiously, and in some respects, perhaps, rather ambiguously worded, but I deny the correctness of the conclusion at which Mr. Buchanan arrives, that "they recognise the continued existence of the treaties of 1788 and 1786."

"Statutes consist of two parts, the words and the sense; and it is the office of an-expositor to put such a

sense upon the words of the statute as is agreeable to equity and right reason."—[Flewd. 363, 465.]

Lord Coke says, "It is the most natural and genuine exposition of a statute, to construe one part of the statute by another part of the same statute, for that best expresseth the meaning of the makers."—1st Inst., 381.

Adopting these rules of construction, let us now apply our minds to the statutes in question.

The 57th of Geo. 3rd, c. 53, says, "All murders and manslaughter committed, or that shall be committed, on land at the settlement in the Bay of Honduras, by any person or persons residing or being within the said settlements" (not excepting even the subjects of the King of Spain), "And all murders and manslaughter committed, or that shall be committed in the Islands of New Zealand and Otaheite, or within any other island, countries, or places, not within his Majesty's dominions, nor subject to any other European state, or power, &c., &c., shall and may be tried, adjudged, and punished, &c."

Now, there are two things to be noted in the words above quoted. 1st. That all murders and manslaughters, committed by any person, or persons, residing, or being in Honduras, may be tried, &c. If it had been the intention of that act to recognise the treaties of 1783 and 1786, which recognition would have amounted to an acknowledgment of the sovereignty of Spain,—the expression would not have been, by any person, which term necessarily includes Spaniards as well as Englishmen,—but the expression would have been—All murders, &c., committed by British subjects residing in Honduras,—or by any person, or persons, not being subjects of the King of Spain. I repeat that that must necessarily have been so,—for the 7th article of the treaty of 1786 prohibits “the meditating any more extensive settlements, or the formation of any system of government, either military or civil, further than such regulation as their Britannic and Catholic Majesties may hereafter judge proper to establish, for maintaining peace and good order amongst their respective subjects.”

2nd. The words are, “Committed on land at the settlement in the Bay of Honduras, &c., or within any other islands, countries, or places not within his Majesty’s dominions, nor subject to any other European state or power.” If, then, a certain portion of the statute, from motives which I do not pretend to inquire into, makes use of words which upon the face of them, and without further investigation, and a consideration of the drift and intention of the act taken as a whole, and a collation of one part of the statute with another part, which parts, when not so compared, resemble the distributed type of the printer, which can convey no ideas,—would seem to favour the notion that Honduras was not deemed to be a dominion of the British crown, the same statute also, in so many words, distinctly declares that it is not a dominion of Spain, the words being, “Nor subject to any European power or state.”

Well, then, I think it cannot with any show of reason be urged that the 57th of Geo. 3rd, c. 53, “recognises the continued existence of the treaties of 1783 and 1786.”

Let us now see if the 59th of Geo. 3rd, c. 44., the other imperial statute alluded to by Mr. Buchanan, has that effect. That statute, after reciting the 57th of Geo. 3rd, c. 53, says, “And whereas doubts have arisen whether in the said settlements in the Bay of Honduras, there be a fort or factory to which a commission may issue for the trial of offences under the said last mentioned act, and whereas by reason of such doubts, and the great delay and difficulty of removing offenders in Honduras for trial to England, or to any of his Majesty’s islands, plantations, colonies, dominions, forts, or factories, such crimes do often times escape unpunished; for remedy whereof be it enacted, by the King’s most excellent Majesty, &c., that from and after the passing of this act, all murders, manslaughters, rapes, robberies, and burglaries, committed, or that shall be committed on land, at the said settlement in the Bay of Honduras, may be inquired of, tried, heard and determined, and adjudged, within the said settlement in the Bay of Honduras, under, or by virtue of the King’s commission, or commissions under the great seal of Great Britain, to be directed to any such four or more discreet persons, as the Lord Chancellor of Great Britain, &c., for the time being, shall from time to time think fit to appoint, &c. And all persons convicted of either of the said offences so to be tried, &c., shall be subject and liable to, and shall suffer all such and the like pains, penalties, or forfeitures as by any law, or laws, now in force, persons convicted of the same respectively would be subject and liable to in case the same were respectively enquired of, tried, heard, determined, and adjudged, within any of his Majesty’s islands, &c.” Whenever a statute expresses that doubts have existed whether such and such things might be done, and it declares that they may, and enacts that they shall be done, then is there an end to all such doubts.

Before the passing of the 59 Geo. III., people doubted

whether Honduras was so far a possession of his Majesty as that a commission might issue to it for the trial of certain offences. That statute put an end to the doubt, by enacting that a commission should issue for that purpose. The statute enacts that all murders, manslaughters, &c., may be tried, by whomsoever committed, and that all persons convicted of the said offences would be subject to the same penalties, &c., as persons convicted of the same offences would be subject and liable to in case the same were respectively enquired of, tried, &c., in any of his Majesty’s dominions.”

This statute may, according to American rules of construction, recognise the treaties with Spain, which strictly prohibit any civil government, any Courts of Justice, or any act whatsoever which shall be inconsistent “with the entire preservation of the right of the Spanish sovereignty over the country.” But it would require an Englishman to live for a pretty considerable time in the States, and to eat bushels of American oysters, a large amount of soft crabs, whole flocks of canvass back ducks, and to drink oceans of dog’s-nose, mint julep, sherry cobbler, and other classical beverages, in which the votaries of Bacchus in that country rejoice, before such a mutation would take place in his cerebellum as would enable him to take that Buchananian view.

There cannot be a more distinct assertion of international right than the erection of judicial tribunals, before which all persons, to whatever nation they may belong, to whomsoever their allegiance may be due, may be tried alike, according to the laws of the country which claims and exercises those rights. Such a judicial tribunal was created by the 59 Geo. III. c. 44, and before it subjects of the crown of Spain may be tried for murder, and, if convicted, may be sentenced to be hanged.

Vattel says, “the empire united to the domain, establishes the jurisdiction of the nation in its territories, or the country that belongs to it. It is that, or its sovereign, who is to exercise justice in all the places under his obedience, to take cognizance of the crimes committed, and the differences that arise in the country.”

Dr. Story, an American jurist, of great and deserved repute, and whose authority Mr. Buchanan must respect, says, “Boullenois has laid down the following among his general principles. He says, “He, or those who have the sovereign authority, have the sole right of making laws, and those laws ought to be executed within the sovereignty where they are known in the prescribed manner. Another maxim or proposition is, that no state or nation can, by its laws, directly affect or bind property out of its own territory, or bind persons not resident therein, whether they are natural born subjects or others. This is a natural consequence of the first proposition, for it would be wholly incompatible with the equality and exclusiveness of the sovereignty of all nations, that any one nation should be at liberty to regulate either persons or things not within its own territory. It would be equivalent to a declaration that the sovereignty over a territory was never exclusive in any nation, but only concurrent with that of all other nations; that each should legislate for all, and none for itself; and that all might establish rules which none were bound to obey. The absurd results from such a state of things need not be dwelt upon. Accordingly, Rodeburgh has significantly said, that no sovereign has a right to give the law beyond his own dominions, and if he attempts it he may be lawfully refused obedience; for wherever the foundation of laws fails, then their force and jurisdiction fail also.”

Would Mr. Buchanan, if he were to condescend to read this paper, now say that the 59 Geo. III. c. 44 recognised the treaties of 1783 and 1786?

But the Commissioners to be appointed under that statute were to receive their authority under the Great Seal of Great Britain. I think no one will attempt to controvert this proposition, that the Great Seal cannot operate in any place which is not under the dominion of the British crown. In the case of the Earl of Derby v.

the Duke of Athol, 2 Ves. Sen. 357-357, Lord Hardwicke, in delivering judgment, said, "Though the tale of Man be granted under the Great Seal of England, English law does not necessarily prevail in it. The Great Seal of England operates in all territories subject to the crown of England, whatever their laws may be. The King can grant, under the Great Seal of England, lands in Ireland, in the plantations, and in Guernsey and Jersey, because they are all parts of his crown."

But by the 59 Geo. III., the king does more than grant lands under the Great Seal, he grants a power of life and death over the subjects of the Spanish Crown. I think I need say no more to prove the absurdity of the proposition that the 59 Geo. III., c. 44, recognises the treaties with Spain of 1783 and 1786.

Mr. Buchanan next observes, "In addition to these Acts of Parliament, it is proper here to report that so late as 1826, Great Britain has, by her treaty with Mexico, acknowledged the continued existence and binding force of the treaty of 1786."

This is a very strange doctrine, that a treaty with one country should be held to give vitality and force to an extinct treaty with another. Supposing we had, in our treaty with Mexico, acknowledged the existence of certain treaties with Spain, what efficacy would such an acknowledgment have as long as it was not made to Spain herself, towards whom we were committing acts and holding language in respect to the territories to which the treaties referred totally inconsistent with such an acknowledgment? But we made no such acknowledgment to Mexico. The following is the article in the treaty with Mexico to which Mr. Buchanan alludes:—

"The subjects of his Britannic Majesty shall on no account or pretext be disturbed or molested in the peaceable possession and exercise of whatever rights, privileges, or immunities they have at any time enjoyed within the limits described and laid down in a convention signed between his said Majesty and the King of Spain, on the 14th of July, 1786, whether such rights, privileges, and immunities shall be derived from the stipulations of the said convention, or from any other concession which may at any time have been made by the King of Spain or his predecessors to British subjects and settlers residing and following their lawful occupations within the limits aforesaid, the two contracting parties reserving, however, for some more fitting opportunity the further arrangements on this article."

Now, the meaning of this article must be obvious to all persons whose bodies are not another mode (as Locke would have called it) or state of existence, of soft crabs and canyars back diuks. The object of the article is that British subjects shall not be disturbed and molested in the peaceable possession and exercise of their rights. Where? Within the limits described and laid down in the convention signed between his Britannic Majesty and the King of Spain, on the 14th of July, 1786."

What rights?

Whatever rights, privileges, and immunities they have at any time enjoyed, whether such rights shall have been derived from the stipulations of the said convention, or from any other concession which may at any time have been made by the King of Spain or his predecessors."

That it will be readily perceived that the treaty with Mexico operates as to the locality in which British subjects are to possess and exercise their rights, that which is laid down in the convention of 1786, but in defining the locality it does not confine itself to that treaty, for it says, "whatever rights which have at any time enjoyed from any other concession which may at any time have been made by the King of Spain or his predecessors. Well, there was no other concession ever, at any time, made by the King of Spain or his predecessors? Yes, there was, and we have seen that a predecessor of the present King, Charles II., agreed to a treaty with Mexico, in which there was the following article:—

"I, Charles II., King of Great Britain, do hereby declare that the most Serene King of

Great Britain, his heirs and successors, shall have, hold, keep, and enjoy for ever, with plenary right of sovereignty, dominion, possession, and propriety, all those lands, regions, islands, colonies, and places whatsoever, being or situated in the West Indies or in any part of America, which the said King of Great Britain or his subjects do at present hold and possess, &c."

I think, then, it is sufficiently clear that the treaty with Mexico does not acknowledge the continued existence of the convention of 1786, seeing that it stipulates that the King of Great Britain shall have "plenary right of sovereignty, dominion, possession, and propriety," and that it only refers to the said convention to ascertain limits within which that "sovereignty and dominion" shall be possessed and exercised. What are those limits, and what are the actual boundaries at the present time of British Honduras to the north of the Belize River, and westward from the sea? These are very important questions, and they must ere long be definitively settled. I shall submit my view of the subject.

But first let me most emphatically repudiate the doctrine, that an agreement or compact with one country can be enforced by another country. If a treaty be violated, it is for parties to that treaty alone who have suffered wrong to resent that violation. Another country, not a party to the treaty (under ordinary circumstances), has no right to interfere. I, of course, make all exception in favour of our ally.

Our treaty with Mexico, previously referred to, without pretending to revive or acknowledge the existence of, as I have already said, the treaties with Spain of 1783 and 1786, but merely taking them as guides for the purpose of defining the boundaries of that portion of British Honduras which was contentious with that country—I mean Mexico—says, "The subjects of his Britannic Majesty shall on no account or pretext whatsoever be disturbed or molested in the peaceable possession, &c., within the limits described and laid down in a convention signed between his said Majesty and the King of Spain on the 14th of July, 1786. Now, the treaty of 1786 does not describe those limits, but it refers to the treaty of 1783. Well, I think I might dwell upon this circumstance, of no little weight, but "not to put too fine an edge upon it," as the little law-stationer in "Bleak House" would have said, I will magnanimously waive that point for the present, only promising to take it up in good earnest, if our American friends should recalcitrate.

I apprehend there are three modes of treating this question.

1. At the time when the treaty with Mexico was negotiated, mahogany and logwood were the only articles of commerce which Honduras was thought capable of producing. The cultivation of the soil was not thought of. It was also believed, although that belief was founded upon an absence of correct information, that all the mahogany and logwood were cut out of the country adjacent to the Hondo, and approximating to the western side. It was also erroneously supposed that the British settlers were not in possession of any of the lands situated to the north-west of the line referred to in the treaty with Mexico. Now the fact is, that the mahogany and logwood were not nearly cut out of those localities. The logwood could not be, for that tree when cut down grows again as luxuriantly as ever. The mahogany tree, like the Scotch fir, never sends forth new shoots, but rots in the ground. This fact proves the ignorance of those who concluded the treaty, when they say, "As it is generally allowed that the woods and forests are preserved, and even multiply by regular and methodical cuttings, the English shall observe this maxim as far as possible."

Knowing that the logwood tree grows again, and imagining that the mahogany tree also did, it was very odd, to say the least of it, that they should come to the conclusion that both those woods were cut out of the country.

It was also a fact that the British settlers had been in undisturbed possession of lands, very far beyond the line referred to, ever since 1798. In that year, the settlers, having repulsed the Spanish invaders, not only regained possession of the country within the supposed limits of the treaties, of which they had from time to time been dispossessed by the encroachments of the Spaniards, but they very laudably helped themselves, by way of interest, to a large tract of country beyond those limits, of which tract they have been in as peaceable and complete possession as of any other portion of British Honduras until the present day, and to which the British Crown has as good and valid a title as to the rest of the country. The treaty with Mexico was therefore concluded on the part of Great Britain under an entire misconception of existing circumstances, in ignorance of the real facts, and in consequence of misrepresentations made by Mexico. This, I apprehend, invalidates the contract. Great Britain agrees to so and so, assuming so and so to be the facts. But Great Britain was deceived—so and so were not the facts. The agreement, therefore, is void. M. Pothier says, "Error is the greatest defect that can occur in a compact, for agreements can only be framed by the consent of the parties, and there can be no consent where the parties are in an error respecting the object of their agreement. * * * Error annuls the agreement not only when it affects the identity of the subject, but also when it affects that quality of the subject which the parties have principally in contemplation, and which makes the substance of it. Therefore, if with the intention of buying from you a pair of silver candlesticks, I buy a pair which was only plated, though you have no intention of deceiving me, being in equal error yourself, the agreement will be void, because my error destroys my consent, for my intention was to buy a pair of silver candlesticks; those which you offer for sale being plated, it cannot be said that they are what I intended to buy. This is decided by Julian in a similar case, when he says, *si as pro auro veneat non valet*. [Pothier, "On Obligation," v. i., p. 13.]

Precisely in this situation do we stand. The British Government never intended, by the treaty above quoted, to give up the undoubted dominion of the crown; they never intended to give up lands which were extremely valuable; but, being under the erroneous impression that the lands in question were of no value, and also being ignorant of the fact that the country had been in the possession of British subjects for a great number of years, without any pretext or remonstrance having been made, they agreed to the article above quoted. These facts, according to the doctrine laid down by Pothier and all other writers upon such subjects, completely nullify the contract. But, as though Mr. Huskisson and Mr. Morier had had some inkling of the real state of affairs, the article concludes with these words:—

"The two contracting parties reserving, however, for some more fitting opportunity, the further arrangements on this article."

The article, therefore, was of a temporary and provisional nature, and subject to be altered and revised at a future period, if it should hereafter be discovered that either or both parties had proceeded upon false data.

2. It is a question of very considerable doubt, whether any portion of the country between the Belize and the Hondo is continuous with Mexico, and whether the whole of it is not continuous with Guatemala. There are very strong reasons for inclining to the latter opinion, and if that be correct we are not bound by any real or imaginary title referred to in the treaty with Mexico inasmuch as we have no treaty with Guatemala which touches that question, and, as I said before, one country cannot take advantage of any admissions, acknowledgments, or obligations, contained in a treaty between ourselves and another country. In our treaty with Mexico, it is stipulated that that country shall on no account molest or disturb British subjects in the peaceable possession

of their rights within a certain line, impinging upon Mexican territory, but we have no treaty with Guatemala stipulating that British subjects shall not be disturbed within a certain line, impinging upon Guatemalan territory; if, therefore, it can be shown that the country between the Belize and the Hondo is continuous with Guatemala, and not with Mexico, we have got no treaty obligation on the subject. The treaty with Mexico relates to a country bordering upon that state; it does not relate to a tract of country bordering upon another state. This must be the meaning of the treaty, or it has no meaning; for how could Mexico agree not to molest British subjects, except upon land bordering upon itself. If it referred to a country not necessarily bordering upon itself, then Mexico would have agreed to abstain from doing what it was impossible she could do, and she might as well have agreed not to bottle up moonshine, nor prevent the sea from rising.

It is a notorious fact, that, previously to the treaties, the whole of British Honduras—the whole of the country between the Siban and the Hondo—was included in the kingdom of Guatemala. In Mr. Black's British Atlas, on the map of Mexico, Guatemala is made to include the district of Peten. But Mr. Wright, in his Gazetteer, published in 1838, goes still farther, for he places Chiapas, a province very considerably to the north-westward of Peten, as may be seen on reference to the map, in Guatemala. He says, "Chiapas intendency, Central America, Republic of Guatemala."

In the "Brief Statement concerning the Eastern Coast of Central America Commercial and Agricultural Company," it is said:—

"In this country, so highly favoured by nature, the Eastern Coast of Central America Company have had the good fortune to obtain from the government of Guatemala a grant by charter, date August 8th, 1834, of the whole of the state of Vera Paz, which is about 250 miles in length, and the same extent in breadth, lying between 15° and 19° north latitude, and 88° and 92° west longitude, and comprising at least 14 millions of acres." Thus it appears that the whole of Vera Paz is in Guatemala. In the Charter granted by the Government of Guatemala to the company, Vera Paz is stated to extend as far as the Rio Grande. This river is considerably to the north of the river Hondo. But what do the Americans say upon this subject? The Committee on Foreign Relations, in their report, say:—

"The Committee so far have conducted the inquiry upon the assumption that those British settlements on the Belize lie altogether within the territory of the Republic of Guatemala. They are, however, aware that this assumption may not pass unquestioned. In the treaty between Great Britain and Mexico, signed at London, December 26, 1826, it would seem, from expressions contained in the 14th article, that it was considered between those two powers, these settlements might be in whole, or in part, within the limits of Mexico, in the state or province of Yucatan, and by some of the European geographers (not Spanish) they are spoken of as in Yucatan. From the best sources of information, however, open to the Committee, they have formed a decided opinion that the boundaries allotted to these settlements by the treaties of 1785 and 1786, before referred to, lie within the republic of Guatemala."

From these authorities,—and many others might be quoted,—it is very apparent that British Honduras is not continuous with Mexico. Consequently, the treaty of 1826, between Great Britain and that state, cannot, does not, lay down any limits which we are bound to observe.

3. But supposing there were no errors on either side when the treaty with Mexico was concluded,—and supposing that the whole of the country between the Belize River and the Hondo is continuous with Mexico, still the 14th article, as far as it relates to boundaries, is worthless, because there is no such line as the one described to be found in nature,—it is entirely a crea-

of the imagination, and evidently the affluence of the brains of the same ingenious individuals who fancied that cutting down mahogany trees multiplied their growth. The words of the treaty are as follows:—

"It is expressly agreed that His Britannic Majesty's subjects shall have the rights of entrance, landing, and carrying away logwood in the district lying between the River Wallis, or Belize, and Rio Hondo, taking the course of the said two rivers for intermediate boundaries so as that the navigation of them be common to both nations, to wit, by the River Wallis, or Belize, from the sea, ascending as far as opposite to a lake or inlet which runs into the land, and forms in streams, or creek, with another similar inlet, which comes from the side of Rio Nuevo, or New River, so that the line of separation shall run straight across the said streams, and meet another lake formed by the waters of the Rio Nuevo, or New River, as its current. The said line shall continue with the course of Rio Nuevo, descending as far as opposite to a river, the source of which is marked in the map, between Rio Nuevo and Rio Hondo, and which empties itself into Rio Hondo, which river shall serve as a common boundary as far as its junction with Rio Hondo, and from thence descending by Rio Hondo to the sea. We are to ascend the River Belize until we come to a lake or inlet. Let us do so, and from the mouth of the source of that river, where do we find such lake or inlet? A main river is that which contains the largest body of water. A branch of a river is a smaller stream, which flows out of it. A tributary stream is an independent water, which flows into it. So the stream marked on the map as flowing from the south-west as its source, is a north-easterly direction to the sea, is the Belize river, and the water sometimes connected with it are either tributaries or branches. Well, then, ascending the Belize river, where do we find this lake or inlet? Nowhere, as Macdonald says, "There is no such thing"—but "An inlet of the brain, a false creation,—proceeding from the heat-oppressed brain."

When you get about 10 or 20 miles up the River Belize, you come to a stream called Black Creek. If you ascend this creek, as it is called, you will assuredly arrive at some such lake or inlet. But Black Creek is not the Belize river, neither is it a branch of it. In this country they have long done in the habit of misapplying the word creek. A creek is a small inlet into the shore from the sea or a river. In Jacob's New Dictionary, it is thus defined:—"Is a part of a haven where anything is landed from the sea, so that it is observed, when you are out of the main sea within the haven, you look round and see how many landing-places there are, so many creeks may be said to belong to that haven. It is also said to be a shore or bank whereon the water beats, running in a small channel from any part of the sea." In this country the term has always erroneously been used to signify a small stream, or the branch of a main river. Webster says:—"In some of the American states it means a small river, but this is contrary to English usage, and is not justified by etymology: but as streams often enter into creeks and small bays, or form them, the name has been extended to small streams in general."

I have stated that Black Creek is neither the Belize river nor a branch of that river. A branch is that which grows out of a thing, not that which flows into it. When a river in its course divides itself into several streams, it is said to ramify, from the Latin word *ramus*, a bough or branch. Now, a branch always proceeds, never accedes. Black Creek, therefore, is not a branch of the Belize. It is an independent stream, it has a source of its own, it flows into the Belize, and it has no relationship to it whatever, until its waters are swallowed up and merged in that river. But to get to this "lake or inlet" we are "to ascend the river Belize," not Black Creek, and ascending this river Belize, according to our instructions, we nowhere come to any such lake or inlet as that to

which the treaty refers. If I give to a person the whole of the land on the bank of a river, from the mouth upwards, as far as a castle built of crystal, with a hundred turrets of jasper, and fifty golden gates, and if he ascend that river, and, between the mouth and the source, he finds no such castle, that it is an *chateau en Espagne*—a *castillo en el aire*,—he would, I apprehend, take all the land situated between those two termini. That the stream marked on the map is the Belize river, and not the one marked Black Creek, the treaty of 1786 proves. That treaty, which extends the limits, says:—"The English line, beginning from the sea, shall take the centre of the River Siban, or Jabon, and continue up to the source of the said river; from thence it shall cross, in a straight line, the intermediate land, till it intersects the river Wallis, Belize, and by the centre of the same river, the said line shall descend to the point where it will meet the line already settled, marked out by the Commissioners of the two crowns in 1783." We are to descend until we arrive at that point. Now, that point is a lake, or inlet, and the only point answerable to it is to be found at a considerable distance up the Black Creek. How, then, by descending the Belize river, can we ever arrive at that point? In order to do so, we must first descend the Belize river, and then ascend the Black Creek. But the treaty does not say so. It says—"And by the centre of the same river the said line shall descend to the point." Well, then, I contend, that neither in ascending nor descending the Belize river do you come to any such lake or inlet. Then, again, it is said:—"The said line shall continue with the course of Rio Nuevo, descending as far as opposite to a river, the source of which is marked in the map, between Rio Nuevo and Rio Hondo, and which empties itself into Rio Hondo."

Again, my argument is founded upon non-existence. If I may be allowed to use such a paradoxical phrase. The commissioners of the two crowns, (the same ingenious worthies who invented a new mode of multiplication by means of subtraction) were extraordinary men. They established lakes and rivers where none existed before. They made rivers change their course and flow backwards. And there is not the least doubt that they could, if they had been put to it, have caught red herrings in the Hondo, and pickled salmon in the Siban. There is no such river as the one mentioned in the treaty,—it is purely an imaginary stream. It may be found, perhaps, upon a Spanish map. Anything may be put upon a map. Just as a man may leave anything in his will, whether he has it or no. But it is not found in nature, and the limits are professed to be defined by natural boundaries. If, then, the natural boundaries referred to as the land-marks of our territory, are not to be found, how are we to define the limits? We must have recourse to those objects which do exist, and they must be the boundaries. The treaty says the Belize river and the Rio Hondo shall be unalterable boundaries. As the treaty with Mexico fails then to assign any ascertainable limit to our territory, because it refers to a line which has no existence, the territory, therefore, is co-extensive with the whole of the country which lies between the Belize and the Hondo, of which we have been in possession since 1798. In the consideration of this very important subject, a question of considerable moment arises,—which is the Rio Hondo? In the map three streams will be observed, all of which commingle and flow in one body to the sea. At the mouth it is unquestionably the Hondo; but which of these three streams is the main river? There cannot be three Hondos, and that river cannot commence at the confluence of the streams, but must begin at the Hondo at its source, and continue as the Hondo until it arrives at the sea. For instance, the river Tagus has its source in the Sierra Albarracin; it flows for 600 miles, but before it arrives at the sea it receives into its bosom the Molina, the Jarama, the Alberche, the Alagon, the Zenere, the Rio del Monti, the Salor, and the Sola. But it has its own independent stream, which is the Tagus from the source

the sea. Tributary streams have a separate existence and a name until they reach the main stream, when they lose their individuality, and become merged, as an estate for life, or for years, is swallowed up and drowned in a fee. Which of the three streams marked upon a map is the main river, or Hondo? One is called Booth's river, one Victoria creek, and another Blue creek. I have already said that a branch of a river is a stream which flows from that river, and not one which goes to it. Booth's river and Victoria creek, therefore, not flowing out of, but into, are not branches, but independent streams, having sources of their own, and characteristics belonging to themselves. It has been asserted that Booth's river is the main river, or Hondo. Now, if we were to admit that, we should lose a large tract of country, consisting of the most fertile plains, and contains clothed to their summits with the most luxuriant vegetation. But we are not at all prepared to admit this; on the contrary, we assert, and are ready to maintain, a *louis outrance*, that the stream called Blue creek is the main river, or Hondo. How are we, when there are several streams, to ascertain the main river? We take it that that stream which is the widest, the deepest, and which contains the largest body of water, is the main river. That river which receives other waters is a main river. At the point of junction, Booth's river and Victoria creek are narrow and shallow streams in comparison with Blue creek. If Blue creek flows into Booth's river, then Booth's river is the main stream. But how can a larger body of water flow into a smaller body of water? The smaller cannot contain the larger. We cannot put St. Paul's Cathedral into St. Paul's over-garden. It comes to this,—that is the main river into which other rivers flow,—a larger stream cannot flow into a smaller stream, but *vice versa*. Booth's river and Victoria creek are smaller streams, consequently if they join Blue creek, Blue creek cannot flow into them, but they must flow into Blue creek, consequently Blue creek must be the main river—*quod erat demonstrandum*. The very term "Blue creek" implies deep creek. Blue water always means deep water. When a ship has got out of soundings, the sailors say "they have got into the water." Blue creek therefore means deep creek, and deep creek means Hondo. Hondo is a Spanish word, and it signifies "profound, deep, far below the surface." The Spaniards gave this name to the river in question, in account of its depth. Blue creek and the Hondo, then, are convertible terms, both signifying deep river. In the course of this argument (very heavy and tedious for me), I have occasionally alluded to Americans and American statesmen. I bear them no disrespect. I enter in the highest opinion of the statesmen, the jurists, and the literary and scientific men of the United States, and towards Americans generally I cherish the warmest feelings of brotherhood. They are an enterprising, a brave, and a noble people. And, as I have spoken of rivers, by that great branch of the maternal stream, as it pursues its majestic course, flowing onwards, swelling and engorging, fed by a thousand meandering rills and mountain torrents, to the goal of all human things, not forget, its plenitude and in its power, the source from which it sprung, and may we also bear in mind that kindness, forbearance, and brotherly love on our part, are the best means of preserving that remembrance.

SOUTH KENSINGTON MUSEUM.

During the week ending 12th June, 1858, the visitors have been as follows:—On Monday, Tuesday, and Friday (free days), 2,824; on Monday and Tuesday evenings, 3,093. On the three Students' days (admission to the public 6d.), 806; one Students' evening, Wednesday, 123. Total, 6,847.

MEETINGS FOR THE ENSUING WEEK.

- THURS. Med. and Chirurg., 8½.
Zoological, 9.
WED. Geological, 8. I. M. Abich, "On the Structure of Etana."
II. Prof. Houghton, "On Lepidomelens in some of the Granites of Ireland." III. Mr. H. Godwin-Austen, "On the Geology of a part of Kashmir." And other Communications.
Royal Soc. Lit., 8½.
THURS. Royal Soc. Club, 6. Anniversary.
Society of Arts, 10. Conference of Representatives of Institutions in Union. 6. 104th Anniversary Dinner.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- Part No. *Delivered on 8th June, 1858.*
316. Royal Military College, Sandhurst—Prospectus of the next Competitive Examination.
317. East India (Correspondence, &c.)—Return.
318. Famine (Scotland)—Return.
104. Bill—Funded Debt.
Delivered on 9th June, 1858.
300. Barracks—Copies or Extracts of Correspondence.
313. National Collections—Return.
315. Anchors—Return.
164. Bills—New General Post Office (Edinburgh).
109. ——— Transfer of Land.
Delivered on 10th June, 1858.
304. Archdeaconry of Middlesex—Return.
103. Bills—Landed Estates (Ireland).
111. ——— Copyhold Acts Amendment.
Delivered on 11th June, 1858.
312. National Debt—Return.
322. East India (Memorials, &c.)—Return.
106. Bills—Local Government (amended).
114. ——— Leases and Sales of Settled Estates Act Amendment.
117. ——— Public Grounds and Playgrounds (amended).
Delivered on 12th and 14th June, 1858.
301 (1). Army (Captain Grant's Kitchens)—Further Return.
311. Game Certificates (Ireland)—Return.
174. Pilotage—Abstract of Returns.
320. Loans, &c., to Foreign States—Account.
321. Civil Service Estimates (Unexpended Balances)—Return.
325. Wine and Spirits—Account.
337. Exhibition of 1851—Correspondence.
89. Bills—Copyright of Designs.
112. ——— Joint Stock Companies Act Amendment.
119. ——— Wills, &c., of British Subjects Abroad.
120. ——— Galway Harbour and Port Act Amendment (Ireland).
121. ——— Peace Preservation (Ireland) Act Continuance.
108. ——— Sale and Transfer of Land (Ireland) (amended).
113. ——— Clerk of Petty Sessions (Ireland).
116. ——— Members' Freedom from Arrest.
118. ——— Commissioners for Exhibition, 1851.
122. ——— Cowley's Charity.
123. ——— Harvey's Charity.
124. ——— Bristol Municipal Charities.
125. ——— Bristol Saint Nicholas and Saint Leonard's Charities.
Delivered on 15th June, 1858.
327. Famine (Scotland)—Return.
331. Mr. John Townsend—Copy of Record of Adjudications of Bankruptcy.
110. Bills—Markets and Fairs (Ireland) (amended).
127. ——— Drafts on Bankers Law Amendment (amended).
Delivered on 16th June, 1858.
324. East India (Udud)—Copy of Letter of Captain Evans.
128. Bill—Stanhope and Wolsingham Rectories (amended).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, June 11, 1858.]

- Dated 29th April, 1858.*
986. W. Smith, 18, Salisbury-street, Adelphi—Imp. in steam-ploughs. (A com.)
Dated 5th May, 1858.
994. G. D. Archibald, Busland-hall, Lancashire—A new and improved mode of treating air and gases, and applying the same for purposes of motive force.
Dated 10th May, 1858.
1028. R. B. Goldsworthy, Manchester—Imp. in machinery for grinding emery and other materials.

Dated 16th May, 1858.

1110. G. M. Casentini, 24, Hercules-buildings, Lambeth—The manufacture of a solution for mixing with or gaging plaster of Paris (or any plaster having sulphate of lime or any similar substance for its base), so as to produce a hardened dense composition, the hardening or setting whereof may be retarded and regulated by the person using the same.
1116. G. M. Miller, Great Southern and Western Railway—Imp. in the joints of bridge rails for railways.
1118. W. E. Newton, 68, Chancery-lane—Imp. applicable to certain descriptions of marine engines, and in the mode of mounting paddle-wheel shafts. (A com.)
1120. W. Clark, 53, Chancery-lane—Imp. in machinery for manufacturing knotted webs or nets. (A com.)

Dated 26th May, 1858.

1122. J. Hesford, Bolton-le-Moors, Lancashire—Imp. in the construction of stretching machines for cotton and other woven fabrics.
1124. A. F. Cossus, Cagliari, Sardinia—Imp. in treating oils and fatty matters.
1126. J. Copcutt, 5, Park-place, Newland-street, Kensington—An imp. in preparing materials employed to obtain light when using oxygen and hydrogen gases.
1128. R. A. Broome, 186, Fleet-street—A method of, and apparatus for, purifying sulphuret of carbon. (A com.)
1132. M. Henry, 84, Fleet-street—Imp. in the manufacture or preparation of ink and paper, to adapt them for copying purposes, in preserving food, skins, and hides, in rendering lint, vesicatory paper, and textile fabrics absorbent, and in treating mortar, cement, and other matters, in order to keep them in a damp state. (A com.)
1134. G. F. Muntz, French Walls, near Birmingham—An imp. in preparing yellow metal sheathing.
1136. S. Bryer, St. George's-terrace, Cheltenham—Improved instruments to be used in the sensitizing and developing of photographic plates.

Dated 22nd May, 1858.

1140. P. Féron, Theuville-aux-Madlons, France—An improved hand-axe or truss.
1142. E. T. Hughes, 123, Chancery-lane—Imp. in machinery or apparatus for embroidering. (A com.)
1144. J. Foot, Spital-square—An imp. in the manufacture of fringes.
1146. T. S. Cressy, High-street, Homerton—Imp. in apparatus for calculating wages.
1148. A. P. Price, Margate—Imp. in the treatment and smelting of certain argentiferous or silver ores.
1150. G. White, 34, Dowgate-hill—A liquor suitable for manufacturing beverages, and for culinary purposes. (A com.)
1152. I. Bagge, Doddington-grove, Kensington—Imp. in electric telegraphs, and in the apparatus employed therein and therewith, parts of which are applicable to other electrical purposes.
1154. W. Clark, 53, Chancery-lane—Imp. in machinery or apparatus for moulding articles of cement. (A com.)

Dated 26th May, 1858.

1177. J. Luis, 12, Welbeck-street, Cavendish-square—A distilling pipe. (A com.)
1179. J. Luis, 12, Welbeck-street, Cavendish-square—The application and use of the fibrous textile plant, called in Arabic "dis," or in Latin "arundo festuca patula," or by botanists "festa coelestis donax tenax," in the manufacturing of pulp for paper, and tow for thread, tussos, and cordage. (A com.)
1183. W. Cowan, Edinburgh—Imp. in machinery or apparatus for disengaging horses from carriages in cases of accident.
1185. M. Henry, 84, Fleet-street—A new or improved fabric and improved sewing and stitching machine, especially applicable for manufacturing the same. (A com.)
1187. J. Stuart, 51y Kate's-hill, Chatham—An imp. in distilling asphalt, pitch, tar, and other bituminous substances.

Dated 27th May, 1858.

1189. A. C. Engert, City-road—A method of preparing the foil, or leaf, in order to its employment as a substitute for silver leaf. (A com.)
1191. C. Cuit and A. Godefroy, Paris—Imp. in railway brakes.
1193. C. Cowper, 26, Southampton-buildings, Chancery-lane—Imp. in machinery for combing and preparing wool, cotton, and other fibrous materials. (A com.)
1195. V. L. Vodor, Westminster Club, Albemarle-street—An imp. on the chimneys and glasses of gas and other lamps.
1197. J. Bower, Hunslet, near Leeds—Imp. in the manufacture of glass.

Dated 28th May, 1858.

1199. C. Stanley and J. Pittall, Birmingham—Imp. in skylights and glass roofing.
1201. M. A. F. Menzies, 39, Rue de l'Echiquier, Paris—An improved key-joint for connecting detached pieces of wood or metal. (A com.)
1203. L. Tindall, Sherwood Foundry, Mansfield—Imp. in machinery, or apparatus for sweeping and cleansing roads and streets.
1205. A. Godet, 31, Rue St. Hubert, Bordeaux, France—Imp. in raising weights.
1207. E. Bond, Wharf-road, City-road—An improved aerated liquid.
- Dated 29th May, 1858.*
1209. E. Sykes, E. Sykes, and P. Sykes, Huddersfield—Imp. in continuous spinning and roving machines for spinning and roving wool, a part of which is applicable to spinning other fibrous substances.

1211. A. Dold, Chatham—Improved apparatus for winding dock, which apparatus is also applicable as a motor for all chimneys usually turned by hand, horse, or other power, and for preventing the descent of smoke into chambers or the places.

1213. J. Martin, Newman-street, Oxford-street—Imp. in apparatus for the prevention or cure of smoky chimneys.
1215. M. A. F. Menzies, 39, Rue de l'Echiquier, Paris—An improved fumigating apparatus. (A com.)
1217. M. Henry, 84, Fleet-street—Improvements in, and in preparing agents for, dyeing, preparing for dyeing, and tanning, and applying certain of the resulting products for obtaining pulp for paper and pasteboard, and the manufacture of blacking. (A com.)

Dated 31st May, 1858.

1219. J. Young and J. Strang, Castle Glen and Glasgow—Imp. in the manufacture of starch, gum, or dextrine, and the compounds.
1221. J. B. Girard, 36, Newmarket-street, Oxford-street, and P. F. Wohlgemuth, 51, New Bond-street, Hanover-square—Imp. in ornamental staining, dyeing, and fixing designs, with letter-press and type printing and cyphering, and coloring wood or any other substances, also extracting, unfarring, or discharging colours from the same.
1223. W. Parsons, Pratt-street, Old Lambeth—Imp. in steam engines, for propelling vessels and other purposes, and in bearings for the screw shafts of steam vessels.
1225. W. E. Newton, 68, Chancery-lane—Imp. in printing and dyeing textile and other fabrics. (A com.)

Dated 1st June, 1858.

1227. C. Binks, London—Imp. in manufacturing soap.
1229. C. F. Vassart, 45, Essex-street, Strand—A kind of tannery to facilitate the locomotion of bedsteads. (A com.)
1231. A. G. Grant, New York—An improved stand or rest for cameras, theodolites, guns, and other articles.
1233. J. Lang, Calder-vale, Garstang, Lancashire—An improved method of signalling on railways.

Dated 2nd June, 1858.

1235. J. Mannhardt, Munich—An imp. in machinery for the manufacturing of peat fit for fuel, and for the squeezing or forcing of fluids out of the said turf, peat, or similar substances.
1237. J. Luis, 12, Welbeck-street, Cavendish-square—A new description of plough, with fore-carriage applicable to it or swing or common ploughs. (A com.)
1239. C. Wheatstone, Hammer-smith—Imp. in electro-magnet telegraphs, and in apparatus connected therewith.
1241. C. Wheatstone, Hammer-smith—Imp. in electro-magnet telegraphs, and apparatus used for transmitting signs or indications to distant places by means of electricity.
1243. J. E. F. Luodcke, Marke, Hanover—Imp. in motive power engines.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1244. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in mill wheels, and in axle-boxes and bearings for the same. (A com.)

WEEKLY LIST OF PATENTS SEALED.

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|--|---------------------------------------|
| 11th June. | 3085. G. A. Everitt. |
| 3087. J. Strathern. | 3097. J. G. Gibson and S. Richardson. |
| 3090. J. Roberts and M. Beale. | 3091. E. Hill. |
| 3098. H. D. P. Cunningham. | 3092. H. Gregory. |
| 3070. M. Bunting. | 3099. M. J. Turner and M. W. Turner. |
| 3194. C. Bahrer. | 3117. T. Hart, jun., and A. Jones. |
| 294. R. Harland. | 3121. R. A. Broome. |
| 616. M. A. F. Menzies. | 3134. J. Tallow and H. Holt. |
| 644. J. J. T. Schlossing and E. Rolland. | 3126. W. Bradford. |
| 842. M. A. F. Menzies. | 3197. A. J. M. Ramer. |
| 886. G. Gilmore. | 9. Archibald Blair. |
| 12th June. | 21. H. C. Jennings. |
| 3075. J. Hogg, junr. | 29. W. Church. |
| 3076. W. Smith. | 212. W. Rhodes and H. Esprit. |
| 3077. E. Bratt. | 709. C. Truss. |
| 3078. J. Bradley. | 619. W. Spence. |
| 3079. J. Chadwick. | 875. W. H. F. Talbot. |
| 3084. T. Howard. | |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

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| 7th June. | 1364. G. Oottam. |
| 1306. C. C. J. Guffroy. | 1365. W. Clay. |
| 1312. I. Lippmann. | 1426. R. Kerrill. |
| 1313. G. F. Chantrell. | 1478. R. Sealey. |
| 1318. C. F. Varley. | |
| 8th June. | 1319. C. Packer. |
| 1321. J. Robinson. | 1399. H. Smith. |
| 9th June. | |
| 1442. F. W. Mowbray. | |
| June 10th. | |
| 1337. W. Armitage. | |
| 1340. W. B. Johnson. | |

Journal of the Society of Arts.

FRIDAY, JUNE 25, 1858.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Society, for the purpose of receiving the Council's Report, and the Treasurers' Statement of the Receipts, Payments, and Expenditure for the past year, and also for the election of officers, will be held on Wednesday next, the 30th instant, at 4 P.M. At the conclusion of the General Meeting, a Special Meeting for the election of members will be held.

The Annual Statement of Receipts, Payments, and Expenditure, for the year ending 31st May, 1858, is to be found at page 498.

SEVENTH ANNUAL CONFERENCE.

The Seventh Annual Conference between Representatives from the Institutions in Union and the Council of the Society, was held yesterday (Thursday), the 24th inst., at the Society's House, in the Adelphi. O. Wentworth Dilke, Esq., Chairman of Council, presided.

The following is a List of the Institutions and Local Boards represented at the Conference, with the names of the respective representatives :—

Abford, Mechanics' Institute	Mr. Hen. Whitfield.
Abury, Mechanics' Institute	Mr. T. A. Hedley.
Amnet, Institute	Mr. Stephen Baldock.
Bedford, Literary Institution	Mr. James Wyatt.
Bedford, (Local Board)	Rev. J. R. Crawford.
Berkhamstead, Messrs. Chance's Library and Reading-room	Mr. F. Talbot.
Bradford (Yorks), Mechanics' Institute	Rev. J. H. Ryland.
Braintree and Bocking, Literary and Mechanics' Institution	Mr. Geo. Courtauld.
Bridgwater, Literary and Scientific Institution	Rev. A. W. Worthington.
Brighton Athenæum	Mr. W. D. Savage.
Brighton, (Local Board)	Mr. W. Wakeford
	Attree.
Bristol Athenæum	Rev. Canon Girdlestone and Mr. Edward Halsall.
	Mr. R. Craeke.
Bury St. Edmund's Athenæum	Mr. R. Laws.
Batham, Rochester, and Stroud Institution	Mr. H. W. Freeland.
Bichester Literary Society and Mechanics' Institute	Mr. Hen. Pease, M.P.
Burlington Mechanics' Institute	Mr. H. D. Hutton.
Bublin Statistical Society	
Bewlsey Literary and Scientific Institution	Rev. P. A. L. Wood.

Falkirk School of Arts	Mr. R. W. Kennard.
Greenwich Society for the Acquisition and Diffusion of Useful Knowledge	Mr. James Spencer.
Halifax, Working Man's College	Mr. Josiah Anderson.
Halifax Mechanics' Institute	Mr. Frank Crossley, M.P.
Hants and Wilts Adult Education Society	Hon. and Rev. Samuel Best.
Hartlepool (West) Literary and Mechanics' Institution	Mr. Robert Reed.
Hastings, Mechanics' Institution	Mr. John Banks.
Hereford Permanent Library	Mr. William Aston.
Hertford, Literary and Scientific Institution	Mr. John Marchant, jun.
Highgate, Literary and Scientific Institution	Mr. James Yates and Mr. William P. Bodkin.
Huntingdon, Literary and Scientific Institution	Mr. Robert Honey.
Leeds, Mechanics' Institution and Local Board	Mr. Alex. McIvor.
" Young Men's Christian Institute	Mr. William Heaton.
" Yorkshire Union of Mechanics' Institutions	Mr. Edward Baines, Mr. J. Hope Shaw, Mr. Thos. Wilson, Mr. Jas. Hole, and Mr. Barnett Blake.
Lewes, Mechanics' Institution	Mr. W. Button and Mr. H. Browne.
Liverpool (Local Board)	Rev. Dr. Hume.
Lockwood Mechanics' Institution	Mr. John Bentley, J.P.
London, Brompton (West) Literary and Mutual Improvement Society, and Local Board	Mr. Ivan C. Jenkyns.
" Clerkenwell Working Men's Institute	Mr. H. A. Nash.
" Crosby Hall Evening Classes	Mr. W. D. Boulter.
" Hackney Literary and Scientific Institution	Mr. Henry Althans.
" Mechanics' Institution and Local Board.	Mr. T. Allen Reed, Mr. S. Valentine, and Mr. T. J. Pearall.
" Newington Tailors' Labour Agency Literary Institute.	Mr. R. Edwards.
" Royal Polytechnic Institution Classes	Mr. J. C. Buckmaster.
" Sherwood Mutual Improvement Society	Mr. William Ness.
" Walworth Literary and Scientific Institution	Mr. J. S. Noldwitt.
Manchester, Mechanics' Institution and Local Board	Mr. Robert Rumney.
Newport Athenæum and Mechanics' Institute	Sir Thomas Phillips.
Northallerton Institute	Mr. W. B. Wrighton.
Peterborough Mechanics' Institute	Dr. Henry Porter.
Plymouth Mechanics' Institute	Mr. Edward Lane.
Portsea, Watt Institute	Mr. Andrew Murray.
Portsmouth and Portsea, Literary and Philosophical Society	Mr. W. Hamilton, R.N.
Reigate, Mechanics' Institution	Mr. Thomas Martin.
Richmond Young Men's Society	Dr. Ellis.
Selby Mechanics' Institution and Local Board	Mr. Thomas Werrey.
Sevenoaks, Literary and Scientific Institution	Mr. George Franks.
Wigan, Mechanics' Institute	Mr. H. Woods, M.P.
York, Institute of Popular Science and Literature	Right Hon. Lord Londesborough.

The SECRETARY read the following

to adopt the scheme to hold an Examination of a group of Institutions, and to make necessary arrangements for the Examination. It was felt that the Examinations be held within the reach of the intended, the members of the Union, who have neither the means nor the opportunity to enable them to attend the Examinations. To carry out this object, the Council invited the formation of Local Boards, and imposed upon them the duty of making a preliminary Examination of the candidates, and spelling of the words, and of the knowledge of English grammar, and of the rules of arithmetic, as well as of those special subjects which were to be examined by the Society.

The object had in view was two-fold. In the first place, it was necessary that some check should be put upon the candidates, to prevent the Society's Examinations from being overwhelmed by a flood of candidates; and, in the second place, it was thought that the establishment of Local Boards would raise up local bodies intended to promote the formation of new candidates in the various subjects.

The Council, as early as circulars were issued, issued the Programme of Examinations to be conducted on this system. It was, however, for various reasons to which it is unnecessary for me to allude, delayed in its publication, and was not issued till December, giving a shorter notice than was intended. This it is proposed to remedy for the future, and the present Council have prepared a new Programme and Time-table, so that the Local Boards, after the Conference, may be able to issue them both before the Examinations.

Notwithstanding this delay, the matter was warmly supported by the Institutions, and the result has been the formation of fifty-eight Local Boards, a much larger number, taking all the circumstances into consideration, than could have been anticipated. A list of these Local Boards is given in the Appendix. Forty of these Local Boards held the Previous Examinations, and received the candidates to the Society's Final Examination, which took place at these forty localities, simultaneously, in Whitsun week, according to a time-table prepared by the Council, so that the papers in each subject were worked all over the country on the same days, and at the same time. Very stringent rules were laid down by the Council, for the guidance of the Boards, in order to secure the honest working of the papers, and the candidates. The papers were sent down in sealed packets, with strict in-

junctions for their being opened in the presence of the candidates, at the special hours and on the special days appropriated for the subjects. The papers, when worked by the candidates, were returned by the Local Boards, accompanied with a declaration, signed by a given number of the Board, to the effect that the papers forwarded therewith were worked, in the presence of a certain number of the Board, by the candidates whose numbers they respectively bore, without any assistance whatever, from books, notes, memoranda, from each other, or from any other person, and that not more than three hours were occupied in working the papers, and that no candidate was allowed to resume, or complete, his paper after having left the examination room in the course of the time assigned to that paper, and further, that the paper of questions given to each candidate was taken from the envelope in which it was transmitted from the Society of Arts, the seal being broken in their presence and in that of the assembled candidates, at the commencement of the time appointed for the paper in the time-table issued by the Society; and, finally, that not fewer than a certain number of the Local Board were present during the whole time that the candidates were engaged with the papers.

The Local Boards, in every instance but one, have most carefully attended to all the regulations; this is a most gratifying circumstance to report, and the Council, as well as the members of the Institutions, must feel deeply indebted to those gentlemen who have, as members of the Local Boards, devoted their time and labour to this object. In the one instance to which I have referred, the Council had no option but at once to withdraw the papers of the candidates. It was felt that, however hard it might be upon the individual Candidates, who thus suffer from no fault of their own, to take a different course would be to imperil the whole system, and destroy public confidence in the Examinations.

The number of Candidates who attended the Previous Examinations was 1,107. Of this number 501 were declared by the Local Boards as eligible for the Final Examination; of them 288 were subsequently examined in Whitsun week, 361 Certificates were awarded to 197 Candidates; 78 Candidates were unsuccessful, and 12 were disqualified through informality. The number of papers looked over by the Examiners was 582, and the Certificates awarded were as follows: Fifty-threes of Excellence, or the 1st grade; one hundred and thirty-two of Proficiency, or the 2nd grade; and one hundred and seventy-six of Competency, or the 3rd grade. Two hundred and twenty-two papers failed to obtain a sufficient number of marks to justify the award of any certificate in respect of them. With regard to the occupations of the Candidate-

the returns show that there were 46 clerks, 7 mechanics, 6 book-keepers, 7 engineers, 4 shipwrights, 7 warehousemen, 2 schoolmasters, 9 printers and compositors, 4 chemists and druggists, 3 surveyors, 3 porters, 3 butchers, besides a grocer, turner, woolsorter, saddler, clothdresser, veterinary surgeon, plasterer, watchmaker, brush-maker, iron moulder, draper, draper's assistant, letter-carrier, a gentleman's servant, a butler, an auctioneer, a millwright, cabinet maker, house decorator, chain maker, mechanical draughtsman, stover, weaver, shovel maker, bricklayer, card-room hand, carpenter, bank cashier, tobaccoist, spinner, joiner, worker in a chemical laboratory, governess, (5 other women,) confectioner, marquerie cutter, engraver, finisher, painter and glazier, assistant master of workhouse, mason, music seller, overlooker. In the Appendix will be found a tabular statement of the ages of the Candidates.

The list of Prizes and Certificates awarded was given in the last number of the *Journal*, but an error in the return from the Crosby-hall Evening Classes having been found, the corrected list will be printed with the Programme for next year.

Such have been the results of the present year's Examination. The establishment of fifty-eight Local Boards is a remarkable event, from which much future good may be anticipated. The direction in which such Local Boards can most usefully employ themselves, forms a matter for discussion at the present Conference.

Three-and-twenty Institutions have joined the Union during the year, whilst during the same period thirty-four have been removed from the Society's books. A large proportion of these have either ceased to exist altogether, or have been unable to continue from want of means to pay the annual subscription. Few comparatively have resigned, and I may venture to report with confidence that the Union never has been in a stronger position than at the present moment, though there have been periods when a larger number of Institutions stood on the Society's books. In the earlier days of the Union the Institutions were allowed to remain longer in arrear, in the hope that they might ultimately be in a position to continue to remain connected with the Society, whilst during the last few years steps have been taken for removing from the list those which appeared unable to contribute the annual subscription, and hence the number of Institutions is less than it formerly was.

The condition of the Institutions is far better than when the Union was first established; there is more attention paid to the really useful objects for which their founders intended them; there are more classes; and, on the part of the public, there is a more general appreciation of their capabilities for good.

These facts, coupled with evidence of their increasing numbers in all directions, contradict the oft-repeated statement that Mechanics' Institutions are failures. They are gradually, slowly it may be, but surely, taking a permanent position in the country, and when we see their results in the Examinations which have lately taken place, whether we look at the Society's Final Examinations, or at those which have been held in connection with the Provincial Union, we cannot but see that they are exercising a powerful influence for good, and assisting very materially to bring about a vast improvement in the education of the country.

I am, Gentlemen,

Your obedient servant,

P. LE NEVE FOSTER,
Secretary.

The following subjects are proposed by the Council for the consideration of the Conference:—

1. At what season of the year can the Final Examinations be best held? At Easter, Whitweek, or at what other period?
2. Into how many separate periods should the time of the Final Examinations be divided? Into four periods, (say) from 2 to 5, and from 6 to 9, on one Monday; and from 6 to 9 on the following Tuesday and Wednesday? or
Into five periods, (say) from 9 to 12, from 2 to 5, and from 6 to 9, on a Tuesday; and from 6 to 9 on the following Thursday and Friday? or
Into six periods, (say) two periods, Monday, 2 to 5, 6 to 9, and from 6 to 9 on the four following evenings.
These periods are merely suggested for illustration of the different arrangements that may be made. The object of the Council is simply to ascertain what will best suit the convenience of the Local Boards and of their Candidates.
3. Whether the present minimum age of candidates, 14, shall be retained, or whether it shall be raised to 17, or to 18.
4. In what manner the Local Boards can beneficially co-operate with the Institutions in forwarding the preparation of their Candidates for Examination.
5. Can the Local Boards advantageously act as administrators of "Prize Schemes" for children between 12 and 16 years of age, so as to induce them to continue their instruction between the time at which they leave their Elementary School, and the time at which they become admissible to the Examinations of the Society of Arts.
6. Whether the Central Museums and Galleries in the Metropolis, which are the property of the public, or subsidised from the public funds, could be rendered useful to the Institutions in different parts of the country, by systematically lending to them specimens for Exhibition, or by granting to them required duplicates.
7. Whether the Conference should pass any resolution in favour of the opening of National Museums and Galleries to the public on an evening.
8. Whether the Society's List of Lecturers should be published.

APPENDIX.—I.

RESULTS OF THE EXAMINATIONS OF 1858.

LOCAL BOARDS.	No. of Candidates examined at the Previous Examination by Local Board.	No. of Candidates who passed the Previous Examination.	No. of Candidates examined at the Final Examination.	No. of Papers worked at the Final Examination.	No. of Candidates who passed the Final Examination.	No. of 1st Class Certificates awarded.	No. of 2nd Class Certificates awarded.	No. of 3rd Class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Prizes awarded to Local Boards.	No. of Prizes awarded to Institutions.	No. of Unsuccessful Candidates.
.....	2	2	2	4	2	2	2	0	2		2	0
.....	10	10	8	8	6	0	3	3				2
..... (Teachers, Chances' Works).	2	2	1	3	1	0	1	1				0
.....	15	5	4	10	2	1	2	3				2
.....	23	17	17	26	16	1	13	9				1
.....	3	3	2	4	2	0	2	1				0
.....	11	11	9	15	8	3	8	3	2		1	1
.....	1	1	1	2	1	1	1	0				0
..... Mechanics' Institution	35	15	12	18	10	3	7	4	1			2
..... Working Men's College	67	21	15	23	11	1	4	10				4
..... (West)	5	3	2	5	2	0	2	3				0
.....	7	6	5	11	4	0	5	4				1
..... Mechanics' Institution	13	10	10	22	8	2	6	7			1	2
..... Institution	14	14	14	43	11	5	9	10	3		2	3
.....	2	2	1	5	1	0	2	1				0
.....	35	35	32	56	16	3	8	17				16
..... (Yorkshire)	1	1	1	2	1	0	1	0				0
..... Brompton	4	4	3	6	3	0	3	2				0
..... Crosby Hall	27	25	24	39	17	11	8	19	6	1	3	7
..... Domestic Mission, Cripplegate	1	1	1	3	1	0	2	1				0
..... Mechanics' Institution	12	8	6	13	5	4	6	1		1		1
..... Royal Polytechnic	29	28	14	29	12	4	4	18	2			2
.....	4	4	4	5	4	0	0	4				0
.....	1	1	1	5	1	1	3	1	1		1	0
.....	83	83	8	12	4	1	0	5				4
..... Institutional Association	591	100	12	0*	0*	0	0	0				0*
..... Mechanics' Institution	32	32	24	39	10	0	8	10				14
..... on-Tyne	3	3	3	5	3	0	1	3				0
..... m (near Halifax)	1	1	1	4	1	0	0	3				0
..... Dock	4	4	4	13	4	1	5	6				0
.....	2	2	2	13	2	3	5	4	3		4	0
.....	1	1	1	2	1	0	0	2				0
.....	10	9	9	11	3	0	2	2				6
.....	1	1	0	0	0	0	0	0				0
.....	20	18	16	23	9	3	3	5	3		2	7
.....	4	4	4	6	3	0	0	5				1
.....	1	1	1	2	1	0	1	1				0
.....	9	6	6	11	5	0	2	5				1
.....	10		1	4	1	0	1	3				0
.....	11	7	7	14	5	3	2	5				2
Total.....	1107	501	288	516	197	53	132	176	25	2	16	79

* Disqualified through informality.

II.

The following is a list of the places at which Local Boards of Examiners were formed in 1858. The places marked with an asterisk no Candidates were examined).

.....	* Carlisle.	Leeds Young Men's Christian Institute.	London, West Brompton.
.....	* Dover.	Lewes.	* Longton.
.....	* Glasgow.	Liverpool.	Louth.
.....	Greenwich.	Lockwood.	Lymington.
.....	Halifax Mechanics' Inst.	London, Crosby Hall.	Macclesfield.
.....	Working Men's College.	..... Domestic Mission.	Manchester Institutional Association.
.....	* Hanley, Potteries Mechanics' Institution.	* .. " Jews and General Literary Institute.	..... Mechanics' Institution.
.....	Hartlepool (West).	..... Mechanics' Inst.	* Middlesbrough.
.....	Ipswich.	..... Royal Polytechnic	* Neath Mechanics' Institution.
.....	Leeds Mechanics' Institution.	* .. Tailors' Labour Agency Literary Inst.	Newcastle-on-Tyne.

Northwram.	Sheffield.
Pembroke Dock.	*Slough.
Portsmouth.	*Stourbridge.
*Richmond (Surrey).	Wakefield.
*Salford.	Warminster.
Salisbury.	Wigan.
Selby.	Windsor.
Sheerness.	York.

III.

This table shows the ages of the 307 Candidates whose return papers were received; of these 288 underwent the Final Examination.

Ages.	Number of Candidates.	Ages.	Number of Candidates.
16	45	27	7
17	30	28	7
18	33	29	5
19	43	30	1
20	36	31	5
21	31	32	4
22	15	33	2
23	10	34	1
24	9	35	3
25	7	37	1
26	11	49	1

IV.

RETURN OF THE NUMBERS COMING UP FOR THE SOCIETY OF ARTS EXAMINATION IN EACH SUBJECT FOR THE THREE YEARS.

	1856.	1857.	1858.
Mathematics.....	27	...	...
Arithmetic.....	...	77	159
Book-keeping.....	...	46	48
Algebra.....	...	58	74
Geometry.....	...	53	53
Mensuration.....	...	42	44
Trigonometry.....	...	25	27
Conic Sections.....	...	14	14
Navigation, &c.....	...	4	5
Physics.....	...	...	...
Statics, Hydrostatics, &c.....	...	11	14
Mechanics.....	13	...	...
Practical Mechanics.....	...	9	8
Magnetism, &c.....	...	9	4
Astronomy.....	...	...	5
Chemistry.....	16	23	13
Physiology.....	6	1	6
Botany.....	2	1	2
Agriculture.....	4	2	0
Political Economy.....	...	6	3
Geography.....	28	28	...
Descriptive Geography.....	...	...	29
Physical Geography.....	...	...	17
English History.....	38	24	43
English Literature.....	17	17	33
Latin and Roman History.....	15	19	12
French.....	17	38	63
German.....	7	15	13
Drawing.....	7	...	...
Free-hand Drawing.....	...	4	37
Mechanical Drawing.....	...	3	34
English Grammar and Composition.....	11	...	...

A report of the proceedings of the Conference will be given in the next number of the *Journal*.

ANNUAL DINNER.

The one hundred and fourth anniversary dinner of the Society took place at St. James's-hall, Piccadilly, yesterday (Thursday), the 24th inst., at six o'clock. The Right Hon. the Earl of Carlisle, K.G., presided. A report of the proceedings will appear in the next number of the *Journal*.

EXAMINATIONS, 1858.

Owing to a mistake made by the authorities at Crosby Hall, in the distribution of the numbered cards, some errors in the names of the candidates have been made in the list published last week. The following letter from the Assistant-Secretary of the Crosby Hall Evening Classes will explain this:—

"Evening Classes for Young Men, Crosby Hall,
"32, Bishopsgate-street Within, June 21, 1858.

"DEAR SIR,—I beg herewith to forward a list of the names of the members of the Evening Classes who attended the recent Examinations, under the supervision of the Crosby Hall Local Board, with the numbers of their respective papers and cards, which, I trust, will enable you to correct the errors in the published list, which, I fear, must have been occasioned by our inattention to the appropriate distribution of the cards.

"I beg to remain, your obedient servant,

"W. D. BOULTER, Assistant-Sec.

"P. Le Neve Foster, Esq., Secretary."

The following is the corrected list of the names of the candidates from the Crosby Hall Evening Classes, who obtained prizes and certificates:—

Candidates' Numbers.

- 468—Robert James White (instead of J. J. Goldsmith) aged 20, clerk—Certificates of Excellence in Arithmetic and Book-keeping.
- 474—Thomas Ross Howard (instead of F. W. Paine) aged 22, clerk—A Certificate of Excellence, and a Second Prize of £3, in Arithmetic; and a Certificate of Excellence and a Second Prize of £3 in Book-keeping; Certificates of Proficiency in Algebra and in Mensuration.
- 485—Frederick William Potter (instead of R. G. Frost), aged 18, clerk—A certificate of Excellence in Arithmetic; and a Certificate of Competency in Algebra.
- 487—Henry Augustus Eliot (instead of R. C. Harrison), aged 24, clerk—A Certificate of Proficiency in Arithmetic, and of Excellence in Book-keeping.
- 469—John Stevens (instead of J. Fretwell), aged 24, customs officer—A Certificate of Competency in Arithmetic.
- 478—James Brady (instead of E. Highton) aged 21, carpenter—Certificates of Competency in Arithmetic and Mensuration.
- 472—Edward Philip Plowman (instead of T. Hall) aged 18, clerk—Certificates of Proficiency in Latin and Roman History, Conic Sections, Mensuration; and of Competency in Geometry.
- 473—Edward Highton (instead of J. Brady) aged 21, clerk—A Certificate of Excellence in Book-keeping, and a Second Prize in Latin.
- 481—Robert Corney Harrison (instead of J. Stevens) aged 23, clerk—A Certificate of Excellence in French.
- 483—John Fretwell (instead of R. Stevens) aged 20, clerk—A Certificate of Excellence in Political Economy.

William Thomas Sturgeon (instead of J. D. Sturgeon), aged 23, compositor—A Certificate of Competency in English History.

James Roberts (instead of E. P. Plowman), aged 22, clerk—A Certificate of Competency in French.

David Gellen, aged 18, clerk—A Certificate of Competency in French.

George Frost (instead of J. Brignall), aged 21, clerk—A Certificate of Competency in French.

Decisions of the Examiners were made to the Candidate and not by name, it will be seen that the order of the awards is not affected by these

The Secretary of the Liverpool Institute wishes to state the following successful Candidates, whose names are in the list published last week, belong to the Institute, and not to the Liverpool Collection:—280. Edwin Guthrie; 288. Conyers Wilfred Johanning; 291. Malcolm Guthrie; 292. Robert Gordon; 294. Richard D. C. Carmichael; 296. Samuel Thomas W. Brooke; 300. Joseph Plaw. Any corrections have been forwarded to the

John Clark Wise, read 87, John Clark Wroe. William Hay, read 89, William Hey. Joseph Plair, read 300, Joseph Plaw. Alfred Pickard, read 836, John Stamford. Certificate of Proficiency in Astronomy.

LA SOCIÉTÉ D'ACCLIMATATION.

The acquisition of land in the *Bois de Boulogne* has been decided by the City of Paris to this Society, with the view of establishing Zoological and Botanical Gardens, in which may be acclimatized such foreign animals and plants as either have been, or may be in future, introduced into France, and which may produce articles of utility or luxury. The expenses are to be borne by a company which is in course of formation, and the appeal is made by the Society to all who may be interested in the promotion of these objects. It is expected that considerable profits will be derived from the sale of the products of the gardens, which, it is anticipated, will become very attractive to the public from their containing so many new and interesting objects, many of which are extremely rare and beautiful. The sale of these articles is expected to yield a large and regular supply of rare and valuable animals, the eggs of birds, and various kinds of plants and grain may be mentioned as among those most likely to attract general notice. A report drawn up by M. Geoffroy de Saint Hilaire, and recently published, which lays considerable stress upon the important results which are likely to be derived from the successful carrying out of this project. If we consider," he says, "that the object of acclimatization is to give to each country, as far as possible, the advantages of the products of every part of the world brought to a state of perfection by the art of man; and when we remember what splendid results have been attained about in all ages by the isolated efforts of persevering and devoted men of science, how much may we venture to expect from a Society such as this, which has among its supporters so many eminent men in every branch of knowledge, many of them of distinguished rank, whose devotion to the cause is so well known. It may be said of this Society that its heart is in the world; that it bears within itself the life of a life longer than that of men, with a continuing power, which enables it to carry on,

with the necessary energy and perseverance, those labours which, when undertaken by individuals, are too often interrupted by death."

The following is a brief *résumé* of what the Society has already done. In 1854, the Society purchased half of the only herd of yaks which had been imported into Europe, and this animal has been, by its means, successfully acclimatized. In 1855, the Society distributed several hundred thousand bulbs of the yam, which is now largely cultivated, and which, it is hoped, may ultimately be a successful rival to the potato.

The cultivation of the *Sorghum saccharinum* has been largely promoted by means of the Society's efforts; this now furnishes to the central and southern districts of France a very excellent and abundant food for cattle, and it is hoped that, owing to the sweetness and purity of its juice, it will open up to the southern provinces a source of profit equal to that which the cultivation of beet-root has afforded to those of the north. The Society has become possessed of a large number of young plants of the Loza, a kind of buckthorn, from which is extracted the beautiful Chinese green, and which is found to resist even the severest winters known in Paris. With the assistance of Marshal Vaillant, General Daumas, and Abd-el-Kader, two flocks of the Angora goat, so remarkable for the fineness of its hair, have been imported, and these animals are found to increase in numbers each year, without showing any sign of degeneracy in the breed. Not only has this Society succeeded in acclimatizing that species of silkworm which feeds on the castor-oil plant, but it has also been able to modify the food of these worms, and to substitute the leaf of the common teasel for that of the castor-oil plant, which is difficult to cultivate in France; and the regulation of the time of hatching has been so far effected, as to make the production of the worm itself almost contemporaneous with that of the leaf on which it feeds. By the assistance of a large number of French missionaries, who have become honorary members of the Society, the propagation in the open air of another species of silkworm, which feeds on oak-leaves, has almost been effected. Two new kinds of the Chinese oak are now growing in the nursery gardens at the *Jardin des Plantes*. The white Chinese nettle, from which it is said that fabrics of a stronger and more glossy character than those made from ordinary flax and hemp may be manufactured, is now being cultivated under the auspices of the Society. The cultivation of a species of pea, which produces oil in great abundance, and is found to be an excellent article of food, is very largely promoted by the Society, which has, moreover, received, in portable conservatories, living specimens of the trees known as the wax-tree and the varnish-tree, with the insects that inhabit them. With the view of restoring the fine qualities of the potato, which have been, to a great extent, lost by too extensive cultivation in Europe and by disease, the Society has had a large number of roots taken from the sides of the Cordillera mountains, and has imported them into France.

It is hoped that a Society which appears to have effected so much, with the small means hitherto at its disposal, will, now that its efforts are beginning to be more highly appreciated, be able to promote, to a large extent, the home production of many articles formerly imported at great expense, and thus secure for France, and ultimately perhaps for other countries, an abundant supply of many important articles of utility and luxury hitherto almost impossible to procure.

SOUTH KENSINGTON MUSEUM.

During the week ending 19th June, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,075; on Monday and Tuesday (free evenings), 3,147. On the three Students' days (admission to the public 6d.), 696; one Students' evening, Wednesday, 101. Total, 6,019.

ANNUAL STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE
YEAR ENDING 31st MAY, 1868.

Dr.			Cr.		
To Subscriptions for the year ending 31st May, 1888:—			By General Establishment Expenses:—		
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
From Members and Institutions in Union with the Society		3357 7 10	Rent, Rates, and Taxes	184 19 7	
*Outstanding	1402 16 0		Insurance, Gas, Coals, and House Charges	167 1 3d	
Deduct due on former years	437 17 0		Salaries, Wages, and Commissions	930 4 0	
Estimated not recoverable	192 19 9		Postage, Stamps, and carriage of Parcels	130 2 10d	
	530 16 9		Stationery and Printing (not including Journal)	100 9 11	
			Advertising	16 13 6	1000 11 1
Life Contributions	771 19 3	186 8 4	By Special Objects:—		
To Dividends on Stock:—			Medals	13 9 6	
£2136 ss. 10d. Consols	149 11 10		Distribution of Books	3 0 6	
£288 1s. 4d. New 3 Per Cents.	11 6 2		Working Classes Museum	112 14 7	
		180 18 0	Prince Consort's Speeches	545 19 8	
To Interest on Deposit Accounts		18 19 7	Two Conversations	2121 4 9	
To Special Objects:—			Do. Cost of Band, discharged by "A Friend"	15 4 6	196 9 3
Gutta Percha Committee	60 10 0		By Journal	841 12 3	818 12 3
Hobart Town Mechanics' Institution for purchase of apparatus	21 8 10		Less charged to Union of Institutions	176 6 5	796 5 8
The Prince Consort's Speeches:—			By Exhibition of Inventions		115 6 1
Subscriptions received	435 5 3		By Union of Institutions, including Journal, Examinations, Postage, Stationery, Printing, and other charges		973 12 1
Do. outstanding	35 9 6	470 14 9	By Re-payment of Principal, secured by Debenture to Messrs. Twining	250 0 0	
*To meet balance of £75 4s. 11d. as on other side, there is Stock in hand—£28 4to. and 1622 12mo. copies.			Interest on Do. to February last	12 3 9	262 3 9
T. Twining, Junr., in aid of the Working Classes Museum	250 0 0		By Repairs and Alterations	66 18 3	
A Friend in discharge of the Cost of the Band at Conversations at Brompton	15 4 6		Library	28 0 4	
Sale of Microscopes	64 4 6		Manchester Visit	75 8 6	
Do. Dr. Booth's Lectures	23 4 8		Dinner, 1857	32 14 0	
Do. Transactions	1 10 6		Address to the H.E.H. the President	17 11 6	
Do. Catalogues of the Exhibition of Inventions	11 1 0		Artistic Copyright Committee	30 4 6	
Repairs to Photographic Collection	4 1 6		Gutta Percha Committee	0 6 6	
P. L. N. Foster	0 1 0	522 1 3	Hobart Town Mechanics' Institution	30 7 5	
To Special Subscriptions held in trust:—			Graham's Town Medical Society	20 2 8	290 12 1
Examination Prize Fund received	190 0 0		By Mulready Exhibition	240 0 0	
Do. do. outstanding	32 17 0		Examination Prizes Advertised	228 0 0	
To Prize Essay on the Financial Position of the Country, in addition to £210 included in last year's statement	78 15 0				
To Balance remaining from the Mulready Exhibition	240 0 0				
To excess of Expenditure over Income		24615 15 0			
		49 11 0			
		24664 6 0			

* The Council have thought it desirable that this item should not be carried into the outer column as in former years.

BALANCE SHEET, 31ST MAY, 1858.

Dr.		Cr.	
To sundry Creditors, viz. :—			
To Tradesmen's Bills	748 12 4	By Cash in hand :—	2 s. d. 2 4
Fees to Examiners	177 5 0	At Messrs. Coatts and Co.....	257 7 10
Salaries and Commissions	31 2 0	At Commercial Bank	115 6 3
	<hr/>		<hr/>
	946 19 4	At London and Westminster Bank, ap- plicable to specific purposes	643 16 2
To Economic Museum	124 18 4	By Consols, £3707 17s. 2d., at 97½.....	3610 6 4
Gutta Percha Committee	60 10 0	By Subscriptions in arrear	1402 18 0
Trust Liabilities in respect of Finance		Estimated as not recoverable to the amount of	300 0 0
Prize Essay.....	288 15 0		<hr/>
Marine Alga Prize	70 0 0	By Government Stock held in trust ap- plicable to specific purposes, viz. :—	
Examination Prize Fund.....	190 0 0	Consols	1433 6 8
Outstanding.....	£32 17s. 0d.	New 3 per Cents.	388 1 4
To Trust Liability in respect of Govern- ment Stock (Consols) held for specific purposes, as per contra, viz. :—			<hr/>
Set apart to answer :—			
Swinye Prize	1333 6 8		
Stock Trust	100 0 0		
To Government Stock New 3 per Cent., set apart to answer Fothergill Trust ...	388 1 4		
	<hr/>		
	£1132 7 8		
	3063 2 5		
	<hr/>		
	£2505 10 1		
By Excess of Assets over Liabilities			

(Signed) W. T. MACKRELL, } Auditor.
J. GEORGE APPOLD, }
P. LE NEVE FOSTER. Secretary.

Proceedings of Institutions.

HASTINGS.—The annual meeting of the Mechanics' Institution was held on 5th May last, at which there was a large attendance of members. George Scrivens, Esq., was in the chair. The report presented by the committee showed a decrease in the number of members during the year; the income, however, had been sufficient to meet the expenses, and there was a balance in favour of the Institution of £4 2s. 11d. The Committee reported that the following lectures had been delivered:—Two on "British India," by Wm. D. L. Badwell, Esq.; one on "John Milton," and one on Hugh Miller, by the Rev. H. J. Piggott; one on the City Arabs, and one on the "Giant Killer," by the Rev. J. A. Blake; one on "Shells and their Inhabitants," by Mr. Clark; two on the "Writings of Chas. Dickens," with especial reference to "Barnaby Rudge," as illustrating the period of the Gordon Riots, by Mr. J. Banks; one on the "Genius and Oratory of Lord Brougham," by the Rev. J. C. Fishbourne; and a Concert by Mr. Albert Dawes; the attendance at the lectures had not on the whole, been encouraging; this was explained partly by the fact that they had not been delivered at equal intervals of time. Some of the students in the classes are mentioned by name as being worthy of recommendation, but the superintendents doubted if any would be likely to succeed in a competitive examination. George Scrivens, Esq., was re-elected president; F. North, Esq., [P.], W. D. L. Shadwell, Esq., Rev. J. H. Fisk, Messrs. Jas. Rock, jun., (mayor), C. J. Womersley, and F. Ransom, vice-presidents; T. S. Hide, treasurer; Messrs. J. Banks and J. Huggett, secretaries. Subsequently a special meeting of the members has been held, to consider the propriety of removing the Institution to more commodious premises, and after much discussion it was resolved to refer the subject to a Building Committee, who were authorised to negotiate with the promoters of a scheme for a large public hall, and to report to a future meeting. It appears that plans for a large central hall, capable of accommodating 1,000 persons, an arcade, rooms for the Mechanics' Institution, and other society, are nearly completed, and if approved by the shareholders of a company which has just been formed for the purpose of erecting the building, Hastings will possess the largest public room in this neighbourhood.

OLDHAM.—The eighteenth annual report of the Oldham Acoustic Commencement by alluding to the loss which the Institution has sustained in the death of its late president, James Platt, Esq., M.P., who had long given it his kind and liberal support. Other losses by death have been alluded to, the report goes on to say that last year has been, to some extent, an experimental year for the Lyceum. Enlarged from its former limited character to its present extended scale, it has been passing through various trials both financial and otherwise. Its financial difficulties are not yet over, as its extended operations have entailed much greater additional expenditure than the increase in the revenue will cover. In every other sense, however, the success has been quite equal to the expectations of the directors. It was predicted that, after the excitement consequent upon the opening of the new building had subsided, the interest taken in it by the working classes would disappear, and the number of members fall off to a very serious extent. The directors rejoice to find that this has not been the case to the amount that might have been expected, and that the average number of this class of members has been, during the year, three times as great as it used to be before the removal; whilst, on the other hand, they regret to say that the number of subscribers of the middle and higher classes has not been augmented. They, however, hope to see ere long a much greater proportion of the names of the tradesmen and manufacturers of the borough upon the list of annual

subscribers. The accompanying returns show the condition of the various departments during the last year:—

MEMBERS.

	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Average during the year.
Females, quarterly	112	100	98	109	104
Males, ditto	409	329	296	399	358
Half-yearly	12	8	11	10	9½
Annual	101	109	111	100	105
Honorary	101	109	113	122	111
Life Members	44	44	44	44	44
Presentees	38	56	61	51	49
Total	808	762	720	835	778½

CLASSES.

The following shows the classes that have been in operation during the year, and the number of pupils in their respective class books. Two classes have been discontinued for want of members, viz., the mental arithmetic, and one for teaching singing upon the ordinary method. Three new ones have been formed, viz., a Latin class, an essay and discussion class, and a singing class upon the Tonic Sol-Fa system.

Classes	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Average during the year.
Female Elementary	112	103	91	104	102½
Do. Sewing, &c.	65	50	39	45	47
Do. French	10	10	11	12	10½
Male Elementary	234	216	179	262	222½
Do. Do. adults	56	36	40	48	45
Do. Grammar, No. 1	34	30	30	36	32½
Do. Do. No. 2	8	12	26	9	16
Do. Mental Arithmetic	13	0	0	0	13
Do. Algebra and Mensuration	12	11	12	12	11½
Do. Geometry	10	6	6	4	6
Do. Mechanical drawing	25	24	22	28	24½
Do. French	12	15	13	10	12½
Do. Latin	0	7	0	14	10½
Do. Essay and Discussion	0	8	9	16	11
Tonic Sol-Fa Singing	0	0	0	107	107

The reports of the teachers appear to be generally satisfactory, showing that there has been upon the part of the pupils a great desire for self-improvement. As a whole, the directors consider that this most valuable department of the Institution has done a vast amount of good during the last year, and, taking into consideration the low charges at which its great advantages are offered, they look forward to continued success in the diffusion of sound and useful education. In order to keep down the expenditure in this branch, the class committee have sought to avail themselves as much as possible of gratuitous assistance in teaching, and they are much indebted to a number of gentlemen, who are each devoting one night per week to this purpose. In the club-room have been held several very agreeable and instructive soirées. The members are indebted to Mr. H. T. Robberds for three papers—respectively on "National Ballads," "Scotch Ballads," and "English Ballads," all of which he ably illustrated. A paper on "Poisoning with Arsenic," has also been given by Mr. John Noton; and one on "The Poetry of Akenside," by Mr. William Bodden. Several lectures and entertainments have been given during the year. With reference to finance, it has been found that the re-arrangement of the library, the compiling and printing of the catalogue, and the numerous expenses consequent upon transforming a small establishment into a large one, have added a great deal to the expenditure of last year, which will probably not be the case in future years; but the debt of £2000 which remains upon the building will, it is feared, be an incumbrance which the Institution is scarcely calculated to bear, unless a much larger number of annual subscribers can be obtained, or some equally certain means devised of permanently increasing the revenue. An effort has already been made to raise, by subscription, a fund for the liquidation of the debt, so as to give greater freedom to the operations of the Institution; but the sudden arrival of the late severe commercial panic has put it out of the power of the directors to conduct it to a satisfactory ter-

migration. However, as an earnest of their intention to rid the Institution of such an incubus, a number of the vice-presidents and directors themselves promised sums amounting to more than £300; and as soon as the improvement in business prospects will admit of its being done with any success, an appeal will be made to the public, when it is hoped that all lovers of education will assist in the work.

MEETINGS FOR THE ENSUING WEEK.

WED.Society of Arts, 4. Annual General Meeting.
THURS. ...Zoological, 5.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Part. No.

Delivered on 17th June, 1858.

130. Bills—Friendly Societies Act Amendment (amended).
131. ——— Juries (Ireland) (No. 2).
132. ——— Trusts, Mortgages, &c.
134. ——— Legitimacy Declaration.

Delivered on 18th June, 1858.

293. Duchy of Lancaster—Return.
299. Lunatic Asylums—Return.
329. Metropolitan Parishes (Roads, &c.)—Return.
342. Dunfermly Union—Returns.
126. Bills—Universities (Scotland) (amended).
128. ——— Protection of Female Children.
133. ——— Common Law Procedure Act Amendment (amended).

Delivered on 19th and 21st June, 1858.

310. Pilotage (Sunderland)—Correspondence.
338. Mal—Account.
336. Bridgewater Union—Return.
337. Workhouses—Return.
341. Sea Fisheries—Return.
345. National Portrait Gallery—1st Report of the Trustees.
290. Rating of Tenements—Returns.
125. Bills—Police Force (Ireland).
139. ——— Administration of Justice (Dublin).
139. ——— Government of India (No. 3).
140. ——— Reformatory Schools (Ireland) (amended).
144. ——— Art Unions Act Amendment.
145. ——— Stipendiary Magistrates.
147. ——— Railways Act (Ireland) Continuance.
148. ——— Portland and Albreda Convention.
Portland and Albreda—Correspondence.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROVISION ALLOWED.

[From Gazette, June 18, 1858.]

Dated 14th May, 1858.

1000. J. Macintosh, North Bank, Regent's-park—Imp. in insulating telegraph wires.

Dated 19th May, 1858.

1114. J. Maudslay, Lambeth—An imp. in the manufacture of iron, and in the furnaces employed therein.

Dated 21st May, 1858.

1120. J. C. Brant, Surrey-square, Old Kent road—Imp. in the permanent way of railways.

Dated 24th May, 1858.

1155. J. Schofield and W. Oudworth, Rochdale—Certain imp. in machinery or apparatus for preparing, doubling, and twisting cotton, and other fibrous substances.

1100. G. Hamilton, Saint Martin's-le-Grand, and W. H. Nash, Poplar—Imp. in locks and keys.

Dated 26th May, 1858.

1162. J. A. Phillips, Earl's Court-terrace, Kensington—Imp. in the production of zinc, lead, copper, and silver, from ores containing these metals.

1164. G. W. Morse, Baton Rouge, Louisiana, U.S.—An imp. in fire-arms, and cartridges to be used therewith.

1166. C. F. D. Moanle, 26, Rue Vendome, Paris—Imp. in the manufacture of rivets, screws, spikes, pins, and nails, and in machinery for that purpose. (A com.)

1170. J. F. Belleville, Paris—An apparatus for indicating the wet of pumps.

1172. W. E. Newton, 66, Chancery-lane—Imp. in breech-loading fire-arms, and cartridges for the same. (A com.)

Dated 26th May, 1858.

1174. F. A. Getty, Accrington—Imp. in treating cotton or wool yarns and fabrics when dyed with certain colours.

1176. J. Luis, 15, Welbeck-street, Cavendish-square—An apparatus for baking firebrick clay. (A com.)

1180. J. C. Biddell, Belfast, D. Ritchie, A. Watson, and J. F. Allen, Glasgow—Imp. in cooking ranges and other fry-pans.

1182. W. Baylis, Wolverhampton—Iron tubular fencing, to be used for general fencing, as well as for the purpose of bridges, and conveying water where required for agricultural & industrial purposes.

1184. P. A. Fourgasie, Cartrou, France—An apparatus for crushing, rolling, weeding, and scarifying, clearing, &c. preparing land. (A com.)

1186. S. O. Lister, Bradford, and J. Warburton, Addingham—Imp. in spinning.

1188. F. Bouquie, Paris—Imp. in the manufacture of chains.

Dated 27th May, 1858.

1192. J. Schofield, Rachelite Lockwood, near Bedfordshire, and A. Harling, Primrose-hill, in Almondbury, Yorkshire—Imp. in means or apparatus employed in weaving.

1194. G. H. Bovill, Durnford Lodge, Wimbledon, Surrey—Imp. in the manufacture of fuel.

1196. C. Clarke, Newmarket Union House, Epsom, Surrey—Imp. in machinery for dibbling wheat and other grain or seeds of manure.

Dated 28th May, 1858.

1198. S. Osler, South Quay, Great Yarmouth, Norfolk—The manufacture of fish into gnaws and food.

1200. T. Dunn and W. Irlam, Manchester—Imp. in machinery for altering the position of locomotive engines and carriages on railways.

1202. M. A. F. Meunier, 39, Rue de l'Hotelier, Paris—An apparatus for biscuit. (A com.)

1204. J. F. Lockart, Young-street, Kensington—Imp. in machinery for cutting and splitting wood.

1206. A. Arsal, Rue du Faubourg St. Honoré, No. 191, Paris—A new bag for horses.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1226. L. A. Bigelow, 133, High Holborn—Imp. in sewing machines. (A com.)—11th June, 1858.

1233. G. T. Bousfield, Loughborough-park, Brixton—Imp. in steam engines. (A com.)—11th June, 1858.

1248. C. C. J. Guffroy, Lille, France—A new smoke-consuming apparatus, and also a new method of introducing the fuel into it.—16th June, 1858.

WEEKLY LIST OF PATENTS SEALED.

June 1858.

3118. R. Furnal.
3119. W. Walker.
3127. W. Thrift and A. High.
3145. G. Bridge and J. Hamer.
3161. G. Burley.
3164. B. Burleigh and F. L. Dancheil.
3193. R. Harner.
476. H. Deacon.
553. J. Webster.
528. A. P. Price.
530. A. P. Price.

537. B. K. Calver.
556. J. Armstrong.
574. J. Cogswell.
583. B. Clegg.

June 22nd.

3142. M. Landon.
3146. D. J. Crossley.
3147. T. Landi, and C. F. niert.
3150. A. F. Kynaston.
3151. J. Moss, T. Gamble, and Gamble.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

June 14th.

1267. H. Bridgewater.
1416. W. E. Newton.

June 16th.

1262. H. Bessemer.
1264. H. Bessemer.
1265. T. Blachard.
1293. J. H. Johnson.

June 17th.

1379. L. H. Reel.

June 18th.

1298. J. Macintosh.

June 19th.

1418. J. L. Jullien.
1422. O. E. Chace.
1445. L. J. Silbermann.
1459. R. Bonnet.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4096	June 10.	{ Portable Backgammon, Chess, and Draught Board. }	J. Jacques	102, Hatton-garden.
4097	" 10.	Tubular or Pipe Steam Boiler.	S. Cartwright and R. Ryall.	Louth, Lincs.
4098	" 15.	Needle-case or Pincushion.	J. Morris and Sons.	Aswood Bank, near Redditch.
4099	" 17.	A Stay Fastening or Bunk.	J. F. Ewall.	1, Albert-terrace, Regent-road.
4100	" 18.	Improved Tumbler Cart.	Fowler and Fry.	Temple-gate Factory, Bristol.
4101	" 23.	The Perfect Union Joint.	E. Russell.	87, Holborn-hill.
4102	" 23.	A Hot Water Cistern for domestic purposes.	W. Wilson.	66, King-street, Manchester.

Journal of the Society of Arts.

FRIDAY, JULY 2, 1858.

SEVENTH ANNUAL CONFERENCE.

THURSDAY, 24TH JUNE, 1858.

The Seventh Annual Conference between Representatives from the Institutions in Union and the Council of the Society, was held on Thursday, the 24th inst., at the Society's House, in the Adelphi. U. Wentworth Dilke, Esq., Chairman of Council, presided.

At the conclusion of the Secretary's report to the Council, read to the Conference, and given in the last number of the *Journal*,*

The CHAIRMAN said, before they commenced the discussion of the subjects contained in the circular which had been issued to the Institutions,† he wished to allude to one or two points which might have some effect upon the discussion. In the first place he would refer to the circumstance of one Local Board having failed to carry out to the strict letter the arrangements of the Council with respect to the recent Examinations. The Council felt that it was hard upon the Candidates that they should suffer from any neglect on the part of the Local Board, and although, under the circumstances, it would not be just that certificates or prizes should be awarded to them, yet as, under ordinary circumstances, two of these candidates would have been entitled to prizes respectively of £5 and £3, those sums would be respectively given by the Council to them, in the shape of presents, and not as prizes. They had heard from the report which had been read that the present Council had taken steps for early submitting to their successors in office the programme and rules for the next year's Examination. So much difficulty had arisen on former occasions from a late publication of the programme, that the present Council would leave on record an expression of their opinion as to the desirability of its being sooner published in future. In preparing this programme for next year, the Council had suggested certain alterations in two or three points which appeared to them of importance; first, as to the number of subjects which the examination should include. On the last occasion there were twenty-six subjects, but on carefully considering the question, the Council came to the conclusion that it would be wise to remove from the list the drawing—both free-hand and mechanical, inasmuch as government now afforded every facility for testing the progress and proficiency of students in that branch in every part of the country, as systematically as could be done under the auspices of the Society. In place of drawing, the Council thought it would be advisable that the theory of music should be inserted. They also considered that geometry and mensuration should form one division instead of two, as at present. He would now call their attention to the first subject which had been put forward for discussion by the Conference. This was—

"At what season of the year can the Final Examinations be best held? At Easter, Whitsuntide, or at what other period?"

He might mention that in Lancashire, Whitsuntide—being the season of general holiday amongst the operative classes—was found to be an inconvenient time. In the original selection of that period, however, it had been thought that holding the Examination during the holidays

would trench less upon the time and earnings of the working men than any other arrangement. But in Lancashire especially, Whitsuntide was a time for the meetings of benevolent societies and other important bodies, and he believed that this had affected the return of the number of candidates from Manchester. Under those circumstances it was thought best to consult the opinions of the delegates on the subject. With regard to the time allowed to elapse between the preliminary and the final Examination, it was thought by some members of the Council that four weeks was sufficient. He (the chairman) was in favour of the longer period of five weeks, but that was a point in which he would yield to the opinion of the majority.

Mr. JAMES HOLE (Yorkshire Union of Institutions) wished to ask if this was a proper time to introduce a resolution upon the subject of Examinations with which he had been charged by the institutions which he represented, and which held a different opinion as to the number of centres of Examination to that which had been expressed in the report just read. It was a fundamental question affecting the Examinations, and he thought his resolution would be properly discussed before they decided the first question upon the paper as to the period to be fixed for the Final Examination. The experience in Leeds, and he believed throughout the whole of Yorkshire, had been unfavourable to the large number of centres of Examination that had been established under the terms of the last programme issued by the Council, and he was instructed to propose that the centres should be very much diminished.

The CHAIRMAN thought it was immaterial when this resolution was brought forward, but he could not but feel that it depended very much upon the localities themselves as to the number of Local Boards they found it desirable to appoint. The Council had certainly seen with regret that it had been found necessary that two Local Boards should be established both at Leeds and at Sheffield.

Mr. HOLZ said the resolution he had to propose was this—

That [this meeting is of opinion that the present system of Examinations of the Society of Arts, conducted through Local Centres, would be improved by introducing the following changes, viz.: 1st. That to the Local Boards should be attached Examiners delegated by the Society of Arts. 2nd. That for this purpose it is essential that the centres of Examination should be reduced in number, and not exceed five. 3rd. That the Examinations be oral as well as by written papers.]

It would be recollected that at a meeting held in that room last year, Mr. Baines attended and urged his views on this question, but the opinion of that meeting was so decidedly in favour of the system adopted in the present year, that the Yorkshire Union, who were anxious, as far as possible, to carry out the views of the Society, determined to give the system a fair trial, and used every exertion to carry it out in the best possible manner. That meeting might not be aware that the Yorkshire Union comprised upwards of 20,000 members of Institutions, and he thought the views of so large a body were entitled to some attention. As a member of one of the Local Boards at Leeds, he begged to state that whilst, in some instances, the attendance of the Examiners was required for only two or three Candidates, there was another Local Board within a short distance of them similarly occupied, and he could not but feel that this was a very unnecessary waste of the time of the Examiners, and under such circumstances it was extremely difficult to conduct the Examinations in a really satisfactory manner. Besides, it seemed too bad to ask gentlemen of standing and education to give up their time merely for the examination of two or three Candidates. He was therefore of opinion that the Society of Arts should in some way control the appointment of the local boards, so as to limit their number to such an extent as to secure a fair number of candidates for each

* See page 492.

† See last No. of *Journal*, p. 494.

Another thing he thought detrimental to the present system was the form in which the examinations were conducted. Under the present system of written papers it really required no great ability on the part of the Local Board to conduct the Examinations, and he thought the form should be so modified as to render necessary the attendance of men of high intellectual character. This would tend to make the examinations more valuable and more satisfactory. Under the present system it was sufficient to have persons in the room to prevent collusion amongst the candidates. If candidates knew that their examination was to be superintended by persons of high intellectual standing, they would consider it a higher distinction to work their papers in the presence of such men. He quite saw the force of the objection raised against the sending down of examiners from London into the provinces, but he thought a plan might be devised for deputed one or two gentlemen from the Society of Arts to superintend and control the examinations, upon a diminution being made in the number of centres, as proposed in the resolution he had submitted. He was happy to find that Yorkshire had taken a fair proportion of the awards in the recent examination, and he thought, both in respect of the magnitude of their operations and what they had done in the matter of the examinations, the Yorkshire Union was entitled to some weight on this subject. He therefore begged to move the resolution which he had read.

Mr. ROWNEY (Manchester Mechanics' Institution and Local Board) seconded the resolution. His experience had been similar to that of Mr. Hole. The resolution, he thought, would be a valuable one. He preferred oral examinations by the Local Boards to an examination exclusively by papers, and in another year he anticipated similar difficulties to those which had been experienced this year, and which had been referred to by Mr. Hole. In Manchester they had as examiners professors of Owen's College and another similar establishment, whose only duty was to watch for three hours over a few candidates, like mere policemen, and in some instances over a single candidate. He thought they would have a difficulty in securing the services of such gentlemen again for such an office. With regard to the time for the final examinations, he thought the examiners were as anxious to be in the country during the holidays as the pupils themselves. He was in favour of limiting the number of centres, and sending down persons from London to supervise the examinations. This could be done without great expense. He regretted the proposed change in the programme, as mentioned by the Chairman, with regard to the drawing. He believed another year would furnish a very large number of candidates in that branch in Manchester. They had already 200 young men two or three nights a week in the drawing classes, and it appeared they excited more interest than almost any other. With regard to the time for holding the final examinations, he would say, that for the district of Manchester, a more inconvenient time could hardly be selected than Whitsun week. Probably Easter would be found more convenient.

The Rev. Canon GRIBBLESTONE (Bristol Athenæum), as chairman of the Local Board of Examiners, had found no difficulty in associating with him a large and competent board, comprising representatives of all classes, churchmen, dissenters, mercantile and professional men. He did not think, as far as he had communicated with persons in his own neighbourhood, that the change proposed by Mr. Hole would be acceptable. With regard to the other part of the question he hoped, for his own part, that there would be no further limitation of the number of centres of examination. He thought the more they were multiplied with discretion, the better, of course always excepting two centres in one place.

Mr. ANDREW MURRAY (Porteus Watt Institution) formed one of the Board of Examiners there with only two candidates, but he agreed with the last speaker that no difficulty was experienced in finding gentlemen of good

standing and high abilities to act as Examiners. With regard to the towns in the south of England, it was extremely undesirable to diminish the number of centres as to impose upon candidates the expense and loss of time in attending examinations at other places. In the populous towns mentioned, he could not understand how they could have any difficulty on the subject of examinations; with the smaller towns it might be different. He had no doubt, if the larger and more flourishing institutions, or Unions of Institutions, would guarantee the expenses of Examiners from London, the Society would be ready to furnish them. As far as his experience of present arrangements went, they had been found very well, and he wished to see no change in respect.

The CHAIRMAN said it might be well that he should state the actual facts as they had occurred in the past. When he visited Sheffield, he found that they had been able to send any candidates to the London Institutions, on account of the distance and that they had, however, been able to avail themselves of the Huddersfield Examinations to some extent, but in this case the distance was found to be a serious drawback. A short time afterwards, some members of the Council attended a meeting at Brighton, at which were present representatives of Institutions in the south coast. When it was proposed to form a Local Board at Brighton, to include these Institutions, a delegate from Lewes wished the meeting to understand that a Local Board at Brighton was practically impossible, although it was a town on the same railway, and within an easy distance. He could think that the Yorkshire Union considered the matter too exclusively from their own point of view. It should be remembered that, although it included Huddersfield, so large a number of candidates in this Union only contributed two guineas to the Society of Arts. When they considered that two of the first prizes at the last Examination were gained by candidates from Banbury and Hampstead, it became an important consideration that such candidates could go for examination if the centres were diminished. With regard to sending examiners from London, this had been tried at the field last year, and great difficulty was then experienced in getting even a few Examiners to go down to the place. The Board of Examiners determined that if of their number should go to Huddersfield, only four should go down, and a local man acting as the fifth. If that was the result, he need not say what would have happened if centres had been attempted, and even with this they could not have accomplished the great object which Examinations were established.

Mr. T. A. HEDLEY (Banbury Mechanics' Institution) said the present system had worked well in his local district. Two Candidates from whence had received first-class certificates and two prizes, and he believed on the next occasion they should have a larger number of Candidates. Oxford would be the nearest centre for Banbury, even that would be attended with inconvenience.

Rev. J. H. RYLAND (Bradford Mechanics' Institution) as president of his Institution, had taken part in the Examination, he hoped with some success. He did not see the force of the argument that had been employed that under the present system of Examination by papers there was a difficulty in getting men of a high intellectual standard to act as Examiners. He considered it a great honour to be asked to act as an Examiner, and there were others of the most distinguished attainments who were the same; if it was only to watch the diligence of young men at their books, he considered it a duty unworthy of men of the highest education. This year of the system must be regarded as an experiment. He had no doubt, on a future occasion, that the small number of candidates spoken of as appearing at some one

would be absorbed in some neighbouring and convenient centre. He considered the Society acted wisely in leaving as much discretion as possible to the authorities in the provinces. He thought the more centres they had the better, consistent with convenience. He expressed a strong opinion at the annual meeting held at Selby, as to the mode of Examination, where he knew that there was a general opinion in favour of oral combined with written Examination. In that opinion he did not share. A system of oral Examination could hardly be conducted by provincial Examiners, and must be confined to the representatives of the Society in London, and hence it would be open to the objection of exclusiveness; for his own part he should certainly hesitate to take upon himself oral Examination in his own institution. If oral Examination was to be admitted, he thought it ought only to be under Examiners sanctioned by the Society of Arts, which, of course, would involve the necessity of delegates from the Society for that purpose. He thought they had had hardly sufficient time to test the efficiency of the present system, but to his own mind it was most satisfactory. The desire which seemed to prevail in some quarters for oral Examination, would appear to have induced the resolution which had been proposed for the diminution of the number of centres. For his own part he had great confidence in what had already been done.

Mr. JAMES SPENCER (Greenwich Society for the Diffusion of Useful Knowledge) agreed with the mover of the resolution as to the desirability of reducing the number of centres of Examination. This had been a year of experiment, and the fact that it was such ought to induce them to ask themselves the question whether it was probable that in another year they would get the same class of gentlemen to act as the Local Boards of Examiners. He did not think persons of high education would be willing to attend the examination of two or three candidates. The question would naturally be asked whether the results were worth the time that was spent upon them. He believed that the candidates felt very little confidence in Examinations carried on according to the present system. Under the former system no one knew of the candidate's want of success except the Examiners themselves, but under the present system he apprehended a degree of diffidence would be felt, lest the failure of any candidate should be exposed to the world. He hoped some steps would be taken by the Council to give the Local Boards as high a character as possible. He thought it was a small compliment to say that a candidate would not travel twenty miles to get a certificate; and seeing that the certificates of the Society had been the means of advancing the position in life of the possessors of them, young men would, in his opinion, consider it worth their while to go after them. Those who sought distinction would husband both their time and their resources to obtain these valuable certificates.

Rev. J. R. CRAWFORD (Berkhamstead Local Board) said, as reference had been made to the Institution which he represented, he felt himself called upon to offer a few remarks upon the present subject, in opposition to the views of the delegates from Manchester and Leeds. He felt that if any innovation of the kind suggested by Mr. Hole were introduced, it would be at the expense of the small Institutions, and for that reason he objected to the resolution. In his own little village they had some ten candidates—young men who were employed in business all the day, and attended classes for evening instruction, in teaching which he was assisted by his coadjutor of the Grammar School. He thought if the pupils had to travel a distance to be examined, there would be a falling off in the number of candidates, although it might be an advantage to such places as Leeds and Manchester. He hoped if any modifications were introduced for the sake of the large towns, there would be no interference with the present system as regarded the smaller towns and villages, because he thought if such a change as was sug-

gested was brought about, the smaller institutions would be sacrificed.

The CHAIRMAN remarked that the difficulty raised by the delegate from Greenwich as to procuring the attendance of the Local Board, would be met by the proposed alteration of the time-table. The Council felt that the time for the preliminary examinations was too extended, and hence a limitation of this had been suggested. It was felt that the Local Boards were called upon to give up more time than could fairly be expected.

Mr. T. J. FRASSELL (London Mechanics' Institution) expressed his opinion that there would be no lack of competent examiners even in cases where few candidates presented themselves. He strongly recommended the Society to persevere in the cause they had so well begun, and, with regard to oral examination, some method might be hereafter adopted to meet the wishes of those who desired it. He fully subscribed to the opinions expressed as to the disadvantage of compelling candidates to travel to a distance to be examined, and on that account he thought it undesirable to diminish the number of centres of examination.

Mr. HARRY CHESTER remarked that this subject had been very fully discussed, and he now begged to offer a very few observations upon it. The whole tenor of Mr. Hole's resolution was the reduction of the number of centres to 5.

Mr. HOLE said he was not particular as to that precise number.

Mr. CHESTER continued:—If this movement was to succeed, it was necessary that the Institutions should have confidence in the governing body of the Society of Arts. The Council had considered this subject, they had discussed it in all its bearings, and seeing their way to carry out a certain object, they did not wish to turn aside from pursuing the only course which they believed they could take, in order to adopt some other plan which they were all but certain would not succeed. If any other body could do this better than the Society of Arts, he, (Mr. Chester) said, let them do it. What was the object they had in view? To improve the education and thereby the well-being of those classes of the community who were connected with Mechanics' Institutes, Atheneums, and Peoples' Colleges throughout the country. A small knowledge of the condition of that class of the population must lead them to see that the faculties of locomotion were not within their reach. If the difficulty occurred of having only one candidate in one locality, it would be easy to transfer that candidate to some other Local Board; that had been done in some cases, and in one instance the candidate had obtained a prize. The Society of Arts above all things could not consent to reduce the number of centres. They wished to have the largest number of centres that the different localities could manage. The map which he held in his hand showed the places in which Local Boards were already established, and they extended over nearly the whole of England, and penetrated even into Wales. They had had examinations at 82 different places. He agreed with Mr. Hole that it was a pity that at Leeds and other towns there should be two boards. It would be better, for the efficiency and good feeling which ought to arise out of operations of this kind, that in those places there should be but one Local Board. The difficulties which separated persons on account of religious distinctions ought not to be allowed to operate, as they were dealing not with the process of education, but with its results. For his own part, his hope was, not that they should reduce the centres from 82 to 5, but that next year they might get from 32 to 50, 60, or even a larger number; he should not be satisfied until he saw this system in operation throughout the whole of the United Kingdom, because he was sure that if it was carried out, it would give the possible impetus to education. All who were acquainted with the details of the subject knew that the

difficulty was the want of appreciation of education. They wanted masters and means to continue education after the time of leaving the elementary schools. This was the first year they had tried this particular method, but he thought it was capable of arriving at great things. He could not think the meeting would accept this resolution, for a general desire had been expressed by most of those who had spoken that the centres should be increased rather than reduced. As to the difficulty of getting competent Boards of Examiners to act, when the number of candidates was small, he thought that objection had been very much got rid of by the speakers who had preceded him. The way to get rid of the difficulty was to extend the Local Boards, and make them permanent throughout the year, so that by counsel, by inspection, and by frequent examination, they might assist materially in promoting classes for instruction in the several Institutions.

Sir THOMAS PHILLIPS (Newport Athenæum and Mechanics' Institution) could not help feeling that this question was at the base of the whole of the operations of the Society. If they passed a resolution to limit the number of centres of examination in the mode suggested, the object of the Society to stimulate—to excite wholesome love and wholesome desire to promote education throughout the provinces must fail. It was all very well to say that young men possessing the ability to rise would make the struggle and undertake the efforts necessary to do so; but ought the Society to expose any one to additional labour by limiting the centres, and compelling candidates to travel long distances, under the embarrassing circumstances of constant employment and limited time? He held that one great good to be done by the system was this—to multiply these local boards, these voluntary associations, who would themselves feel, and would impress on others, the value of education, and it was by multiplying rather than limiting the operations of these boards that the Society would do most good. It certainly was not for the Society to discourage the formation of Local Boards wherever circumstances enabled them to be established, and it was for the localities themselves to determine whether circumstances rendered it possible that such associations should be formed. It was somewhat remarkable that the objection to the present system should come, not from the rural districts, or places with a limited number of students, but from the great hives of industry—from those places where there were the greatest number of students—that they should be opposed to the distribution of these Local Boards amongst the rural districts, and should apparently wish to confine them to their own localities. They said, in fact—"Give us Local Boards of Examiners, but do not distribute them through the length and breadth of the land." Whatever might have been the difficulties in this experiment, the attempt to correct them in the manner proposed would, he thought, impair the usefulness of the Society, and he hoped that no expression would go from this conference that it was their desire to limit so seriously the area of the Society's operations.

Mr. ALEXANDER MOLYOR (Leeds Mechanics' Institution and Local Board) thought the speakers on this subject had overlooked one important element in Mr. Hole's proposal, which was, that the Council of the Society should be represented by one or more examiners at each of the proposed five centres. He knew that this was regarded by many as very important; and though it was desirable, on the one hand, not to check the formation of Local Boards throughout the country, yet, on the other hand, it was necessary to prevent an unnecessary multiplication of them. It was easy to find in populous districts efficient men to act as examiners. Owen's College contained men of as high reputation as any of the colleges of the metropolis, and professors of other provincial colleges were men of great eminence. The Leeds Board of Examiners was composed chiefly of professional men, chemists, physiologists, teachers of natural science, and

persons of high professional standing. He thought that whilst the results might be dealt with by the Society, the process of education should form one of the functions of the Local Boards, who should exercise constant supervision over the classes in their respective institutions. He thought it was a matter of pride and social distinction, that a person should be regarded in the locality as an examiner on the part of the Society of Arts. He was satisfied that if the composition of Local Boards were properly attended to, it would be a matter of high interest to be engaged in working out so excellent a scheme.

Mr. HENRY COLE, C.B., would venture to take the opinion of the meeting upon a resolution completely opposite to that proposed by Mr. Hole. He begged to move as an amendment:—

That the Conference is of opinion that it is for the benefit of those for whom the Society of Arts' Examinations are intended, that the system of Local Boards should be extended throughout the Society's Union, wherever the locality can make satisfactory arrangements for the working of such Boards.

They often met with strange paradoxes; and to have, as they had on this and former occasions, the impersonation of extreme voluntarism contending that they could not do their own work, but must have extrinsic aid, was one of those strange contradictions that were sometimes met with in life. If he had been asked to fix upon any place where he would suppose they could do their own work, it would of all others have been Leeds; yet the representatives of Yorkshire came up to this conference with a proposition which he could not but say was rather selfish—which was entirely for the benefit of that district, and tending to the injury and disparagement of such smaller places as Pembroke and Berkhamstead, and a stultification of the principle, so much contended for in the present day, that education should be made voluntary, and that they should have as little centralisation as possible. He believed the feeling of the meeting was that it was the business of this Society to try and stimulate a feeling throughout the country that people should do their own work, and to that end it was necessary to have as many centres as possible. If he wished to run into an opposite extreme, he should say it was expedient to have not merely 50 but 600 centres, but it was the business of the Society to recommend only that which was justified by experience. He thought this proposition for five centres an undesirable one, and with that view he proposed the amendment which he had read.

Mr. STEPHEN BALDOCK (Barnet Literary Institution) having intended to move a resolution similar to that submitted to Mr. Cole, had great pleasure in seconding the amendment. The resolution he had intended to propose set forth that the meeting entertained the fullest confidence in the manner in which the Council had proceeded in the matter of the Examinations.

Mr. BARNETT BLAKE (Yorkshire Union) contended that the resolution of Mr. Hole was opposed upon fallacious grounds. It was not intended by it to limit the means of examination or the local influence which gave value to those Examinations. He could state, from a practical knowledge of the working of 120 Institutions, how the matter stood. Although at the time the Council determined upon the change in the mode of examination, the Yorkshire Union expressed an opinion as to the value of oral examination, they nevertheless lent their aid to make the present system as efficient as possible. The whole of Yorkshire was mapped out, showing the places best adapted for centres of Examination, and 12 were suggested for Yorkshire, and of that number 9 were fixed upon. The Institutions were advised as to how they had better form Local Boards, in order that every success should attend the scheme. In Halifax they had no fewer than three Local Boards.

A DELEGATE inquired how that happened.

Mr. BLAKE replied, simply because there was no control over them, and the real fact was, that there was

some little rivalry on the two sides of the water at Halifax. Were those bodies to unite in Leeds and Halifax, as they did in the first instance at Sheffield, it would give them a status and a position, and all foolish rivalry would cease. The feeling amongst some of the largest educational establishments in Yorkshire was that the departure from the oral system deprived those Examinations of their greatest value. But then it was objected on the part of the Society that it was impossible to extend the system of Examination if the personal attendance of a Board of Examiners from London was called for, and it was indispensable to have uniformity of system. He contended that there was not in the resolution of Mr. Hole the paradox which Mr. Cole had represented as proceeding from the advocates of voluntarism. The Yorkshire Union did not wish to deprive other places of benefits which they claimed for themselves. With reference to the time for holding the final Examinations, he would suggest that this should be about the first week in April. With regard to the remark of the chairman, that from the Yorkshire Union the Society only received the ordinary subscription of two guineas a year, it was to be borne in mind that a great many members of that Union paid their 2 guineas besides, and the Union would be happy to make the subscription 20 guineas if it were required, in order to make the Examinations really of value. What he felt was, that they required the presence of at least one gentleman deputed by the Society of Arts to superintend the Examinations, and to see that the rules of the Society were strictly adhered to. If this were done he felt that a higher value would be attached to the Examinations.

The Hon. and Rev. SAMUEL BEST (Hants and Wilts Adult Education Society) had pleasure in supporting the amendment of Mr. Cole. He represented upwards of 100 institutions in the southern parts of England, which were probably almost unknown to the gentlemen of Yorkshire, and they could, therefore, expect but little of their sympathy. He most earnestly hoped the plan now adopted would not be interfered with, and that oral examination, which was found practically to be impossible, would not be returned to. If it were, he believed it would be destructive of the whole efforts of the Society, and would defeat what he believed to be the really successful mode of examination that had been adopted. What they wanted in carrying out the present plan was not men of extraordinary abilities, but men of honesty and sound integrity, to see that the examinations were carried out in accordance with the regulations laid down by the Society. Having conducted this sort of examination for the last three years, he had no hesitation in saying that he found no difficulty in getting persons to act as examiners in the various institutions with which he was connected. He believed some hints had been taken by the Society from the working of the Hants and Wilts Association with respect to the examinations. He felt called upon to oppose in the strongest manner the proposition which had been made for reducing the number of centres of examination. If that resolution were carried, such places as Lympington and Berkhampstead would be blotted out of the map, and yet they were places of considerable importance in connection with this educational movement, and candidates from them had distinguished themselves. He had great pleasure in supporting the amendment proposed by Mr. Cole upon the ground that he should be extremely unwilling to cripple local exertion in any way.

Mr. HOLE (as the mover of the resolution) replied upon the discussion. He said most of the remarks that had been made had arisen from a misconception of his intentions. He did not appear as the representative of the voluntary system, but, in the present instance, he rather took the opposite side. His (Mr. Hole's) main argument on this subject was, that in proportion as they increased the number of centres, they diminished the importance of the Examinations. Last year they had two centres, this

year there were 58, but of 16 out of that number they had heard nothing at all. They had therefore only 32 effective centres. At the two centres last year they had 220 candidates, whilst at the 32 centres they had only 299 candidates.

Mr. CHESTER remarked that they had this year excluded pupils of schools. The total number of candidates from Institutions was much greater this year than last.

Mr. HOLE contended that if the number of candidates had been in the ratio of the addition to the number of centres, there ought to have been at least 500 or 600 candidates this year. With regard to the resolution he had proposed, he did not wish to bind himself as to the precise number of centres. He held that the number of centres ought to be that which would command the greatest amount of influence. He was in favour of few centres and properly qualified Examiners at each centre, and he thought such a plan would command an amount of success which they would vainly hope for under the present system. The experiment had been fairly tried this year, and he thought the results were not such as ought to be satisfactory to them. They must feel that it should not be allowed that any persons who chose should set themselves up as Boards of Examiners. He believed the expense of sending down representatives of the Society at the Examinations, with a limited number of centres, would be amply compensated by the results that would follow such a plan. He had no doubt the Yorkshire Union would readily pay £10 or £20 towards the expenses of gentlemen in whom they had confidence to conduct the Examinations. It was not his intention obstinately to contend for oral Examination, but he submitted that if they wished for success in this movement, they must decrease the number of centres, and must make the Examinations of the highest possible character.

The CHAIRMAN said they had had some little experience to guide them during the last 12 months, as regarded the Oxford Examinations. Although they charged an examination fee of 30s. to each candidate, which would naturally tend to limit the number, yet it was found necessary to establish 12 centres of Examination, which he thought was an argument very strongly in favour of increasing rather than diminishing the number of centres in connection with their own scheme.

The CHAIRMAN then put the amendment of Mr. Cole, which was carried by a very large majority.

I. & II.—PERIOD FOR THE FINAL EXAMINATION.

The CHAIRMAN called the attention of the Conference to the first question proposed for discussion by the Council, viz., the season of the year at which the Final Examinations could be best held? He should be glad to receive the opinions of the delegates on this subject, as the Council had no other feeling than to consult as far as possible the convenience of the Institutions.

Several Delegates offered suggestions as to the most suitable period. It was argued that Whitsuntide had generally been found an inconvenient time, owing to its being a season of holiday making, and it was submitted that the already too restricted opportunities of recreation for the working classes ought not to be still further curtailed. Various periods between Easter and Whitsuntide were suggested. It was urged that it would be desirable to hold the Examination as early as possible in the spring, and as soon as possible after the period of closing the classes which were usually carried on during the winter months.

Mr. CHESTER remarked that connected with this question was that of the periods into which the final examinations should be divided. If they reduced those periods, it would be easier to determine the time of year at which the final examinations should be held. This year it had been found necessary to extend the periods over the whole of the week, because the time tables could not be lished until they knew the number of candidates examined in each subject, but in future the time

difficulty was the want of men. They wanted masters and men after the time of leaving the school was the first year they had to but he thought it was caprice. He could not think the resolution, for a general decision of those who had spoken, increased rather than reduced getting competent Board of number of candidates was tion had been very many who had preceded him. The duty was to extend the manent throughout the spection, and by fre materially in prom several Institutions.

Mr. Thomas P. H. The question was at the of the Society. If the number of centres of the object of the Society some love and whole throughout the province well to say that you would make the strary to do so; but one to additional compelling candidate embarrassing circumstances limited time? The by the system was these voluntary and would impress it was by multi of these boards certainly was mation of Local them to be themselves to it possible that was somewhat sent system, places with a great hives of were the great opposed to the the rural dist them to them as Local Board them through Whatever the experiment, the proposed work, the Society, and he to this conference seriously the pro

Mr. A. H. The and Local just had over proposal, which should be rep of the proposed guided by man desirable, on the Local Boards the hand it was the position of the true efficient constructed the hope of the the colleges were of the of the

were pictures which would not be required for a central collection, and Mr. Ruskin had stated that six collections of the late Mr. Turner's pictures might be sent round into the provinces, to exemplify the style of that great artist. He believed that, if the Institutions made a stir in this matter, there was no reason why there should not be circulating museums of superfluous treasures of the central national collection; and his own opinion was, that if the various Institutions put a pressure upon their representatives in Parliament, the Government would be inclined to yield the request that the provinces should have that boon conferred upon them. In France, there was hardly a provincial town in which there were not local collections of museums, which were interesting enough, but not, in his opinion, so interesting as a succession of such collections would be. On the part of the Council, therefore, he begged to press this matter upon the attention of the delegates.

Mr. McIVOR had great pleasure in supporting this suggestion.

Mr. BLAKE believed the people in Yorkshire cared very little about seeing the whole contents of the British Museum. He did not anticipate any great advantages from the proposition.

Rev. J. H. RYLAND wished to vindicate the people of Yorkshire from the character of indifference in such matters which had been ascribed to them by the last speaker. He thought a migratory museum would be very highly appreciated by the people of the provinces.

Mr. PEARSALL contended for the London Institutions being included in the proposition.

The Rev. A. W. WORTHINGTON considered it would be a great boon to the country towns to have such a collection sent round.

The Rev. Canon GIRDLESTONE proposed—

That it is desirable that the Central Museums and Galleries of the Metropolis, such as the British Museum, the National Gallery, &c., which are the property of the whole nation, should be rendered, as far as possible, useful to the Institutions in various parts of the country, by systematically lending to them specimens for exhibition, or by granting to them unrequited facilities.

The Rev. J. H. RYLAND had great pleasure in seconding the motion.

Mr. PEARSALL proposed, as an amendment, the insertion of the words "including London," which was seconded.

Mr. W. D. BOULTER (Crosby Hall Evening Classes.) Upon a show of hands the amendment was negatived by large majority, and the original motion was carried.

VII.—OPENING OF MUSEUMS IN THE EVENING.

The next proposition considered was, "Whether the Conference should pass any resolutions in favour of the opening of the national museums and galleries to the public of an evening."

Mr. CHESTER had no hesitation in calling upon the Conference to answer that question in the affirmative, and the resolution he would propose was—

That this Conference requests the Council of the Society of Arts to bring under the consideration of Her Majesty's Government the question whether the National Museums and Galleries cannot and ought not to be opened of an evening, in order that they may be accessible to those numerous classes of the community who, contributing towards the expenses of maintaining the National Museums and Galleries, and being well able to profit by access to them, are at present practically debarred from visiting them, because they are only open during the day.

He said that large masses of the community were virtually excluded from the great national exhibitions, from the circumstance of their being closed in the evenings. The experiment of evening exhibition had been tried at the South Kensington Museum, which had been visited by nearly 8,000 and 4,000 persons a week in the evenings. They were mainly indebted to the exertions of Mr. Henry Cole for that great public boon.

Mr. ROBERT RUMNEY seconded the resolution.

Mr. HENRY COLE said it might not be generally known that 800,000 upon an average annually visited the metropolis from the provinces, most of whom were probably engaged in business in the daytime. He laid before the meeting statistics which he had collected, showing that in several large manufactories within easy distances of the National Gallery, out of the hundreds of the workmen employed in these establishments very few had ever visited that exhibition, and the same with the British Museum, owing, in a great measure, to the fact that those places were closed in the evenings, which was the only opportunity that the generality of the working classes had of visiting them. During the last year the South Kensington Museum had been visited by no fewer than 488,000 persons, of whom by far the greater number had attended in the evening, the museum being open for three hours on three evenings in a week. He thought the delegates of the various Institutions would render good service by passing this resolution, and suggested that they should urge the matter upon the attention of their respective representatives in Parliament.

After a brief conversation the resolution was unanimously agreed to.

VIII. LIST OF LECTURERS.

The remaining subject upon the paper was "Whether the Society's list of lecturers shall be republished."

Mr. W. R. KENNARD (Falkirk School of Arts) proposed the following resolution:—

That with reference to the republication of the list of lecturers, this Conference desires to express its opinion of the importance of encouraging the system of public lectures, and it urges upon the officers of the Society of Arts to give their best assistance to the Institutions in connexion with the Society, to assist them in obtaining the services of the most talented and experienced lecturers.

The delegates who took part in the discussion that followed upon this subject, expressed generally an opinion in favour of the republication of the list of lecturers. It was stated on the part of the Council that the list was prepared from the returns of the Institutions with respect to the lecturers they had employed, but that the Council could not undertake to recommend any particular lecturers, or to make arrangements for their engagement by the Institutions.

After some conversation the resolution of Mr. Kennard was withdrawn, and the following resolution, on the motion of Mr. Edwards (Tailors' Labour Agency), was passed:—

That this Conference requests the Council to republish the list of lecturers.

The business upon the paper having been concluded,

Mr. SPENCER (Greenwich) moved a resolution to the effect that a separate account should be kept of the funds received from the Institutions in Union and the disbursement of the same, in order, he said, that they might judge of the amount of benefit which they derived from their connection with the Society. In his own Institution it had been questioned whether the advantages they derived were equal to the subscription they paid.

The CHAIRMAN said the account had been kept separate from the first, and had been so published in the *Journal*, as a part of the annual financial statement of the Society, a copy of which had, as Mr. Edwards was aware, been sent to every Institution. In addition to this, the Society's books were open to the inspection of every member. Upon the subject of the benefit derived by the Institutions from the union, he would inform them that the Society had this year received £540 from the Institutions and had spent upon them £1,070.

After a brief conversation the resolution, which found no seconder, was withdrawn.

Mr. H. W. FREELAND (Chichester Literary Society) with reference to the question of rating, stated that

school as well as progress was most esteemed by the "office ticket," which was a printed card, which took subjects in which the scholars. This prize was most eagerly sought.

The Hon. and Rev. Mr. B. agreeing with the proposal would nevertheless stick with the existing plan for school children. The scholars were anxiously encouraged by Mr. C. to become scholars in the places which were open to them.

Mr. CHESTER said that the district that which he was in places which were open to them.

Mr. BEST considered the Association had a great deal in this regard in working up examinations. In his Associations during the past evening schools, the most valuable in when there was the evil influence.

The Rev. J. H. which addressed the object to the idea of Examinations of the youngest members believed that it had been mentioned in the Institution were given for Examinations, the purpose of the sessions of Examinations could say that it was of interest than the this proposition had been put that the Local plan.

Mr. TALLEY position made it

Mr. CHESTER

That it would be a great advantage, and the Society of Administrators of the years of age, so between the time school, and the Examinations of

The resolution

Sir THOMAS administration appeared to have been in adapted to the plan pointed out. The acquainted with the embraced two attendance at the station for examination. The longest attendance shall have been definite number of examination. The simply desired

ex-

observe that the

Royal Highness to the Arts, the Sciences, and the Manufacturing Industry of the country, so far from being merely superficial and clap-trap, will be found to be solid, truthful, and enduring. I beg to give—"His Royal Highness the Prince Consort, the Prince of Wales, and the rest of the Royal Family."

The toast was drunk with loud cheering.

The CHAIRMAN again rose and said—Gentlemen,—In now having to call your attention to the toast which more immediately concerns the purpose which has assembled us here together, I really feel that some excuse to you is due in consequence of that toast being entrusted to a person who, for peculiar reasons, and his previous absence from this country, probably knows less what to say about it than almost any one of those whom he has the honour to address. When I allude, however, gentlemen, to my absence from the country and from the sphere of the operations of this Society, and from this metropolitan centre of art, I do not mean to convey that I have been exiled, like the poet Ovid, to a barbarous country—on the contrary, gentlemen, one of the last duties I had the honour of performing in the sister country was the inauguration of the statue of the great lyrical poet, Moore, in Dublin. I trust, also, that I have bequeathed a project of erecting another statue in the same city—one to Oliver Goldsmith. (Protracted cheering.) Now, gentlemen, will you do as much for the statues of our poets in London? (Renewed applause.) I am very happy, too, in the presence of our friend Mr. Deane, to bear my testimony to the beautiful architecture with which his father and his brother have adorned the metropolis of Ireland. However, gentlemen, for the reasons I have mentioned, I feel myself less able than almost any one of you to give you any succinct account of the recent operations of this Society. I do not feel called upon so delve into its remote antiquity—time-honoured as its annals have proved themselves to be. It will be sufficient for me to advert to the impetus which your Society has lately given to that which is justly considered as one of the leading movements of the day, the system of public examinations. I know that a great object with your Society has been to promote the formation of classes for instruction, not as a substitute, but as a useful and even a superior supplement to the desultory delivering of lectures; and I believe this promising system is very mainly owing to the zeal and energy which were displayed upon the subject by one of the members of your Council, Mr. Chester. (Hear, hear.) As an inducement to the formation of these classes for instruction, the Society of Arts has instituted a system of examinations, and give certificates for three different grades of merit. Now, what has been, briefly, the progress of this experiment? I find that when the offer was first mooted, it was responded to by only one candidate. In the next year, 1856, the first examinations were held in London, upon which occasion 62 candidates attended. It was found that the various Mechanics' Institutes throughout the country which had been affiliated with this Society found it inconvenient to send their respective members up to one single centre of examination in London; and, in the next year, 1857, two central places of examination were adopted, London and Huddersfield, the latter happening to be the headquarters for that year of the Yorkshire Union of Mechanics' Institutes. 80 candidates attended that year in London, and 140 in Huddersfield. As, however, these two centres of examination were found very inconvenient for those who wished to attend the examinations,—members of the 320 Institutions associated with this Society, and scattered through the length and breadth of the United Kingdom,—it was thought advisable to adopt a scheme which would very much dispense with that inconvenience, and it was determined to hold the examinations simultaneously in various places through the whole extent of the union wherever the local bodies were provided with the necessary organiza-

tion; and it was settled that the examinations were to be conducted wholly by papers. Fifty-eight Local Boards were established, at forty of which candidates have in the present year presented themselves. The list of prizes and certificates has been published, and it occupies a goodly space in the publications of this Society, and as a living instance is worth a good deal of paper, I am happy to say that we have at this board a gentleman partaking of our fare (Mr. Wicker), who, in the modest position of an apprentice in the Dockyard at Portsmouth has carried off three prizes at the recent contest. The labours of the Society have by no means been confined to the subject of examinations. Among the important subjects which have attracted its notice since the last anniversary I may enumerate the consideration of the law of Artistic Copyright, in reference to which, I believe, there is a scheme in a great degree of forwardness, and which I hope may be submitted to the legislature. It has also had under its consideration the means of securing the durability of gutta serena, and the cheap production of aluminium. Now, with reference to the more general subject of art, which it is the special province and object of your society to foster and promote, I think there is no doubt that, with some drawbacks and exceptions, it is impossible not to feel that a great general advancement has been made in the public taste and refinement. I think indications of this are to be perceived in the exterior of our dwellings, in the decorations of our apartments, in the forms and fashion of our furniture, in our plate, in our porcelain, in the increased taste for painting and for sculpture—and I may, I am sure, allude to that gay concave and that starry firmament now above us. Of course all exteriors and all interiors will not be so happy and so admirable in their execution as either the Museum at Trinity College, Dublin, or the St. James's Hall, of London. True art, like every other good thing, must always to a certain degree be accompanied by its conceits and its quackeries; but allow me to say that the very existence if the imitation proves in some degree the presence of the reality; and I feel sure, that never, as a country, were we less liable to the accusation of being indifferent to the high claims of art and of literature. This, gentlemen, happily is not the place for the introduction of any topic even bordering upon politics, for it seems to be a certain law in politics that there is always something bitter or disparaging to be said about either things or persons. I may still, however, be permitted to remark that two of the highest and most important offices in the present administration of the country are filled by gentlemen most distinguished in literature. I turn to the most eloquent orator in the House of Commons, and I find Mr. Gladstone devoting his leisure not merely to elucidate the consummate merits of the prince of poets, but to trace and illustrate the connexion between the veritable traditions of antiquity, and that scroll of heavenly revelation which is the charter of hope and the blessing of the whole family of men. What then, next, is all but the latest addition to the ancient peerage of this realm? Why the most eminent of historians—Lord Macaulay. Now it seems to me that these particular cases go far to show that literature, at least, has in our days obtained its due recognition and honours in the state. It is the more special object of your society to encourage and increase a relish and reverence for art among the masses of our countrymen; and I trust that under the joint ennobling influences of literature and art, our glorious old England, which has so many other titles to greatness, is destined to fulfil all the highest missions of civilisation. I beg to give "Prosperity to the Society for the Encouragement of Arts, Manufactures, and Commerce."

The toast was drunk with protracted cheering.

Mr. C. WENTWORTH DILKE (Chairman of the Council) said it would ill become him to detain them more than a few seconds in acknowledging, on the part of the Society, the graceful manner in which their eloquent

had introduced this toast. For his own part he might state that his star of office in the Society was fast waning, but he could not but say that he had never been associated with a body of gentlemen who were more anxious than his colleagues in the Council to promote in every possible way the advancement of Arts, Manufactures, and Commerce. He ventured to assert that although some errors might have been made, they were errors of judgment, and not errors of intention.

Sir THOMAS PHILLIPS said he had been entrusted with the toast of "Prosperity to the Institutions in Union with this Society." Unless he had deceived himself very much, the Institutions in Union were calculated in time to produce a very important effect upon the education of the artisans of this country. The object, as he understood it, of this Society in associating with itself the various Institutions connected with the instruction of the working classes, was to systematise the advantages offered to them in these various Institutions, and to afford to the individuals in them the opportunity of systematic examination, and, where they deserved it, of appropriate reward. But very few years had passed since this scheme of the Society was promulgated, and, considering the necessary difficulties that presented themselves to the carrying out in the length and breadth of the land an organisation so important as that which they had sought to establish, the success that had attended it was no unsatisfactory omen of its future importance. The noble earl in the chair had told them that two years ago one single candidate only presented himself for examination. This year, however, more than 500 young men were reported to the Society as being qualified to be examined in one or other of the subjects included in the Society's programme. Three hundred, or nearly that number, came up for examination, and, he believed, but for accidental circumstances, connected partly with the period selected for the examination, and other matters which did not affect the merits of the candidates, 400 persons would have been examined. Of those 300 who came up, 199 were certified to be deserving of the Society's certificate, and those 199 successful competitors took away 360 certificates. Now, he could not help thinking that although that was an inconsiderable number compared with the number of young men who were seeking to prepare themselves for the active duties of life by self-culture throughout this country, it was nevertheless no unsatisfactory indication of the extent to which this movement might at no distant period be carried. When they looked around them, and beheld in their own times and in the generations now past, the distinguished men that had risen from inferior positions of life—acquiring well-merited distinction by their own unaided powers, and the faculties which God had given them, he was sure they would not regard any estimate too high which might be formed of an Institution which laboured to give stimulus and encouragement to their praiseworthy efforts. What would George Stephenson have given for the educational advantages enjoyed by young men in the present day? What would men who had risen like George Stephenson—and he believed there were not on record circumstances more interesting than those which surrounded the life of George Stephenson—what would men like him have given if they could have obtained that amount of assistance which the aid this Society offered gave, and if they had known that at the age of 16 years those advantages were open to them. They lived in times when the economical pressure of the age limited rather than extended the period of school life. It was most deeply to be deplored. Those who thought most upon the subject doubted most whether the period could be extended. They could hardly hope to extend it while the pressure of necessity compelled parents to send their children out into the world to assist in supplying the general wants of the family. Therefore it was of the deepest importance that—having sown the seed in early life—in the school life, they should afford, as far

as in them lay, the opportunity of continuing that training and that culture during the period of active labour. That could only be done by means such as this Society afforded, or rather the means afforded by the local Institutions; and here it was that their assistance and suggestions seemed to be of the utmost importance to these local bodies. He himself had the honour to belong to a local Institution in a part of the country where he was sorry to say that adult instruction was pursued to a very inconsiderable extent, but no one could doubt, from the activity that prevailed throughout the country—from the circumstances connected with these Examinations—from the character of the persons who had succeeded—from the position in life of many men who had obtained first prizes—that they were sowing seed which would at no distant time produce to them a rich harvest. He would not detain them longer. The noble chairman had directed their attention to the fact that they had in the room a young man of well-merited distinction, and he hoped such an example would act as a stimulus to others in the same walks of life to seek to earn the distinction he had gained. He begged to propose "Prosperity to the Institutions in Union with the Society of Arts."

The toast was drunk with cheering.

The Rev. Canon GIRDLESTONE said it was with sincere satisfaction he rose to tender the thanks of the provincial Institutions in connexion with the Society of Arts for the honour done them by the present toast. It had been observed during the course of the morning's proceedings, and, he believed, in some degree questioned,—what benefits the Institutions derived from their connexion with the Society of Arts. For his own part he spoke his own feeling, and, he believed, the feeling of the great majority, if not of all, the representatives of the institutions, when he said that it was impossible to calculate the advantages which they in the provinces derived from the connexion with this central Society. He thought they had only to look to that topic which had been already adverted to, viz., the system of examinations which had been instituted in connexion with this Society, to see at once the great advantage which they derived from their union with it. He had also to express the deep gratitude he felt for what the Committee of Council on Education had done in this great cause; but if there was in this country one class more than another for whom little had been done in the way of education it was the middle class. He, therefore, hailed with the greatest satisfaction this movement which had emanated from the Society of Arts, and he believed if it was carried through with the zeal with which it had been commenced, it would do an incalculable amount of good in stimulating competitive examinations in the Grammar Schools and other establishments in which the middle classes for the most part received their education, and in this respect he regarded the connection of the provincial associations with this Society as a great advantage: even in the mere matter of money—although, of course, guineas were but a poor measure of the value of this privilege—yet in the mere matter of money alone, the Society had done quite as much for the provincial institutions as the institutions themselves had done for the Society of Arts, and, indeed, much more. But passing from that which was gone by to that which was still to come, he did hope that if those resolutions which had been passed in the morning were carried into effect, if they were permitted to meet again at the close of another year, they would have to perform a still greater act of gratitude to this Society. He would take this opportunity of impressing upon the gentlemen who formed the Council of the Society, that no greater boon could be conferred upon the middle classes of the provinces than enforcing upon her Majesty's Government the great desirability of first of all opening the various public museums of the metropolis in the evening to the middle and the labouring classes, and, secondly, that some portions of

what might be called the superfluous wealth of those museums should, in some sort of manner, be made to minister to the advantage and instruction of the provinces. He confessed that as a minister of that word which the noble lord in the chair had so eloquently described as the great charter of the whole family of man, he hailed with the greatest gratitude, as the handmaid of religion, the progress of science, art, and education. In no case was religion more thoroughly brought to bear than in those operations which were under the influence of the Society of Arts. Therefore, he had no hesitation, as a minister of the Gospel, in tendering, as the representative of an Institution in one of the most ancient cities of the country—Bristol—his gratitude to the Society for permitting the union which existed between them, and in thanking the company most sincerely in the name of those representatives of Institutions by whom he was surrounded for the honour they had done them in drinking this toast.

Mr. HARRY CHESTER said:—Any stranger attending the Conference which took place that morning, would probably have gone away with the impression that the only matters upon which the Society concerned itself were those connected with the education of the people; and although he would have seen that the largest interpretation was given to that term, that they considered it to include not only the instruction of the people, but likewise all that concerned their social and industrial position; he might have been tempted to ask why it was that the Society for the Encouragement of Arts, Manufactures, and Commerce concerned itself so anxiously with the education of the working classes. The answer to that was that they knew there was no means by which they could carry out the chartered objects of the Society so well as by laying deep and extending the foundation on which all improvements in arts, manufactures, and commerce must depend. But they did not confine themselves to education, they dealt with every kind of subject which could be reared on the superstructure of that foundation. He had been requested to propose that they should drink to the health, and wish success to the labours, of those gentlemen—a very numerous body—who formed the various committees of the Society of Arts. He thought his powers of arithmetic would fail if he attempted to tell how many members were serving upon their committees; but he wished them to bear in mind that as the Society of Arts was a multifarious and omnivorous body, which concerned itself with all kinds of subjects, it would be impossible for any body, limited as the Council must be, to discharge one-tenth of its functions, or to touch one-tenth of the subjects embraced by it, unless they were assisted by some extraneous organisation co-operating with them. Those committees (said Mr. Chester) are, in fact members of our body. They are our means of locomotion, our wings and feet, which enable us to pervade all sorts of subjects. They are our tentacula, which enable us to feel our way, to feel where we can safely go, and where we had better withdraw. They are the prehensile instruments, which enable us to lay our hands on things and persons. They are our stomach, in which all sorts of things are digested and brought into proper condition to be dealt with by the Council. Some of the subjects with which the Society is dealing have been already alluded to. Your lordship has mentioned the Artistic Copyright Committee, presided over by Sir Charles Eastlake. I may further mention that we have a committee which has prepared a report about to be circulated to the Institutions and Chambers of Commerce in Union, on the subject of a Small Parcels Post. The Society desires to have it well considered whether the facilities afforded by the Post Office for the transmission of letters might not be extended to the transmission of small parcels. There is another committee which is engaged on a smaller and more humble, but yet useful subject, the invention of a good portable writing-case for soldiers, sailors, and emigrants.

There is another committee dealing with the very important subject of Gutta Serena, investigating the causes of its decay, and pointing out the nature of the defects to which that substance is incident, and the remedies to be obtained for them. Another committee is engaged in considering whether in the suburbs of this metropolis and in the provincial towns, galleries, and museums in connection with the great central National Gallery and Museums of the metropolis might not with advantage be formed. Another committee is employed in dealing with the subject of Aluminium, and another with the subject of Surgical Instruments, and this last is the committee to which I would direct your particular attention, because I have been instructed to couple with this toast the name of the gentleman who acts as the chairman of that committee, Mr. James Luke. I believe those most conversant with surgical instruments, are of opinion that they are not in that advanced state of perfection in which they ought to be; that sufficient prominence was not given to that department in the Exhibition of 1851, and that the time has arrived when special attention should be directed to that subject. A large committee is, therefore, engaged in considering their present state, and how they may be improved. That subject has been considered worthy the attention of the most distinguished members of the medical profession, and those gentlemen have done Mr. Luke the high honour to request him to preside over them. That is an honour which he may justly be proud of, for it is no small distinction for a gentleman to be selected by a large body of his own profession to represent them in this most important matter. I am sure, therefore, you will with great pleasure drink "The Health of the Committees of the Society, coupled with the name of Mr. James Luke, the Chairman of the Committee on Surgical Instruments." (Much applause.)

Mr. JAMES LUKE said he felt that in attempting to return thanks he had undertaken an extremely difficult task, because there were so many different sections composing the various committees, and he could only very imperfectly represent that with which he was more immediately connected. He felt that it was unnecessary to enlarge upon this toast, because so much had been said already upon the general characteristics of this Society, that even if he felt inclined to lengthen his remarks, they would be but a repetition of those which had been offered by preceding speakers. He could only say that the various members of the committees were most anxious to carry out the tasks entrusted to them by the Council of the Society, and, having said this, he could only add the expression of their sincere thanks for the honour now conferred upon them. (Cheers.)

Mr. J. SCOTT RUSSELL, F.R.S., then rose and said:—My Lord and Gentlemen,—I have great pleasure in proposing the toast which has been placed in my hands this evening, and I am sure you will have great satisfaction in hearing that the speeches appropriate to the toast have already been made by my predecessors, so that it is not now necessary for me to make any long preface to it. The toast which I have to propose is "The Society's Examiners" in those educational examinations of which you have heard so much to-night. The noble lord in the chair has informed you that one of the most important functions which the Society now performs is that of encouraging, through its associated Institutions, education in the provinces. In short, from the experience I have had of now nearly 20 years in the working of this Society, I may say that whereas hitherto the Society has chiefly devoted its attention to the arts and inventions which the talent of the working classes of England has produced during the past century of its existence, it has now turned from the cultivation of the inventions themselves to tilling and manuring the soil out of which these inventions grow. It is a modern revelation of chemistry that you can take nothing out of the land but what you put into it. It is a modern revelation of physiology that you cannot take a qr

work out of a man unless you put a corresponding quantity of nutritious food into him; and it is also a very recent discovery, due, I believe, to those wonderfully multifarious committees of the Society—that you cannot take inventions out of a man's head unless you put education into it. Now, the experience of the past century of inventions produced before the Society of Arts, and rewarded by them, and the experience and my own knowledge for the last 20 years of the working of the Society, enables me to say this—that that Society has rewarded an enormous number of good inventions, but that it has discouraged at least ten times that number of bad inventions; and that in almost every case the good inventions have been produced where science was super-added to practical knowledge, and that the bad inventions have been produced, and the time of the producers and of the Society wasted, when the inventions were made by practical men who were ignorant of the theoretical principles of those inventions, or by theoretical men totally unacquainted with the practical portion of the subject to which they directed their attention. Now, it is hopeless on the part of the Society to attempt to knock practical knowledge into the heads of scientific men. That is quite beyond their sphere, and I believe beyond the sphere of anybody else, so they have taken to the other duty—that of endeavouring to engraft upon the strong, robust stem of the workman, of the practical man, the graft of education, of knowledge, of the addition, in short, to the experience of the hard-working practical man of that which is called science, but which is merely the experience of all other men added together superinduced upon his. Now, then, I think you will say that in doing this the Society of Arts has come to a very practical conclusion, and a very scientific way of producing practical inventions by the true combination of science with practice. And allow me to say, as having had the good fortune to receive the education of a thorough working man in my youth, and to have had superadded to that the blessing of a university education, permit me to say, after having superintended more or less for the last 30 years the labours of multitudes of men, that I do not know any way in which you could forward the interests of Great Britain more properly at the present moment than by assisting in the education of the working mechanics and practical men of England; because, let me tell you, there is no man so good a workman—there is no man who gives you so large a day's work in return for your day's wages, as your practical workman, who knows the principles of what he is about. Let me tell you, also, that the practical workmen of England are in a little more danger at the present moment than they think for, and the reason is that education in other countries has been—I do not say is—has been making more rapid progress in the last 12 or 15 years than it has been making in England; and allow me to tell you that the German workman in every skilled craft has been making during that time enormous progress, and I may add enormous inroads upon the English workman. Permit me to tell you that there are in this country 86,000 German workmen in the most skilled departments of trade, for no other reason than that they can learn in certain schools of art and working schools in Germany a great deal more of mathematics, of chemistry, and of theoretical mechanics than our own workmen possess, and when we try to get a skilled foreman on reasonable terms, we are generally obliged to take a foreigner,—usually a German. I say this is a great pity, because there is not in the world a finer workman—a man prouder of his work—a man abler to do work in the most finished, solid, substantial, permanent manner, than the English workman, and he only wants that you should do him justice. I say you; I will tell you why I say you—that you, the educated, and governing, and leading classes, should do him justice,—to be all that you could desire. I say this, because it is the upper and governing classes in Germany and elsewhere that are providing this education for their workmen. It is not the workmen themselves;

therefore, if you want our workmen to keep pace with them, you, the educated; you, the enlightened; you, the metropolitan employers—you must try to do all in your power to extend education among the working men of England. Now, I am happy to say, that the Society's Examiners are a set of educated men, scholars, gentlemen of high reputation, who are devoting themselves to co-operate with you in the most admirable manner, is stimulating, encouraging, singling out, and rewarding all those young men who, under the tuition of the local societies in connection with the Society of Arts, are now very numerous and very successful. Mr. Chester has told us—than whom no one is more competent to form a correct opinion, and who, I believe, had the principal share in pushing on this educational movement—he has told us that the examinations of the present year have been most successful, and, therefore, I propose that we return to the Examiners, on behalf of the working classes, whose interests they have so much promoted, our best thanks for the services they have rendered to the community and to us in the course of the examinations of the present year, and, coupled with that toast, I beg to give the name of a gentleman who is intimately connected with the education of England, and a thoroughly practical man in these matters, the Rev. Morgan Cowie. (Loud applause.)

The Rev. MORGAN COWIE returned thanks. He said many of the examiners had been, and still were, connected with education in different places, and they took great interest in this movement which had been taken by the Society, and felt happy in being able to give their time and such talents as they possessed to forward so excellent a scheme. He felt that they were acting as loyal subjects to the Queen in promoting, as far as they could, any plan which elevated the working classes of the country, or which had a tendency to do so. The results of the examinations, he might say generally, were extremely satisfactory, and the number of candidates had considerably increased. He was not one of the examiners till the present year; therefore, he was not competent to make any comparison with former years. In geometry he had very fair results indeed, and also in algebra, which was not a very attractive study to young men of this class. He believed there was still room for improvement, and he hoped in future years to see the system grow. He would not detain them longer than to express, on behalf of his brother examiners and on his own part, their thanks for being permitted to assist in this important work. (Cheers.)

The CHAIRMAN gave as the next toast “The House of Commons.” It was only right (his lordship said) that they should show their respect for those who represented them in parliament, and he begged to couple with the toast the name of Sir Joseph Paxton, with respect to whom he would merely observe that all the world had had the means of becoming acquainted with his general claims to respect and admiration, but he (the chairman) had had special opportunities of estimating the sterling qualities of his heart and virtues of his life. He begged to give “The House of Commons and Sir Joseph Paxton.” (Drunk with loud cheering.)

Sir JOSEPH PAXTON said he could have wished that the duty of returning thanks for this toast had devolved upon some more distinguished member of the House of Commons than himself; but although he was only a humble member of that house, he believed he could duly appreciate the advantages which this country, and he might say the world, derived from having a deliberative assembly so free and so practical as the British House of Commons. It was true that latterly their course had been somewhat eccentric, but he had no doubt that in time the machinery would bring itself right, and they would go on in the ordinary course of legislation. With regard to commerce, he might say that during the last 15 years the House of Commons had been treading in the right direction by liberating it as far as possible from

every trammel. With reference to manufactures, he was sorry that the government had anything to do with them, for the only things they manufactured were arms, cannons, and ammunition, and those were not matters very intimately connected with the progress of the Society of Arts. But with regard to art and invention, he felt that the House of Commons had behaved in a manner suitable to the importance of the subject, with, he might say, one or two exceptions. There was one exception with regard to the Patent Laws. He maintained that it was wrong—that it was unjust, that a man's brains should be taxed—that the inventions of his mind should be placed under the ordinary taxation of the country, and the produce of that tax applied to the ordinary purposes of the State. He contended that if any tax of that kind existed, it ought to be applied for the purpose of advancing the interests of arts, science, manufactures, and commerce; and he thought it was a disgrace to the present age that this revenue should be employed for the ordinary purposes of the country. The House of Commons had always very readily voted money for the maintenance of the British Museum and other establishments for the promotion of art in this country. There was only one thing that they had set their minds against, and that they had done most pertinaciously,—that was against any grand centralization at Kensington. He did not now discuss whether in that they were right or wrong, but he was happy to say that the connection between the Royal Commissioners of the Exhibition of 1851 and the Government was about to close. He believed in a very short time the government would have their money, and the Commissioners of 1851 would be free to act upon their own resources; he hoped they would then see something worth having after the great delay which had taken place. He hoped the Royal Commissioners of 1851, having slumbered for six years, would eventually rise up triumphant for some great good. About 10 years ago they would remember that Europe was the scene of anarchy and bloodshed. Almost every continental city, with but one or two exceptions, was the scene of political disorder and riot. About that time, or a little after, the notion which first emanated from the Society of Arts, for the Exhibition of 1851, was brought forward. Whilst, in 1848, the continent was in the midst of bloodshed and confusion, in 1858 there was nothing talked about but war with our neighbours. He hoped to see some sort of parallel between the two epochs, and that out of war's alarms some other object should arise upon which to centre their ideas and their exertions. On that account he confessed that he felt a little surprised, that neither by the noble lord in the chair, nor by his friend Mr. Chester, nor by any other gentleman connected with the Council of the Society, had a single word been said upon a point which was brought before the public a little while ago, and which was much talked about at the time, viz., an Exhibition in 1861. It did appear strange to him, that after the Council had deliberated and decided upon this point—and he must tell them that, as a vice-president of the Society, he had attended nearly all those meetings—that having deliberately decided that it would be advisable to have an Exhibition in 1861, to which he gave his most hearty concurrence,—he said it did appear strange that not a word had been said upon the subject that evening. By some it was argued that it was too soon after the Great Exhibition, and he believed the proposition fell upon the ears of many persons rather flatly. But he thought if it had been fairly set forth to the public—if circulars had been sent round to the various institutions in connection with the mother Society, they would have heard a little more about the project for '61 than they had heard that night from the governing body of the Society. He had no wish to divulge the secrets of the Council, but he should like to tell the present company what sort of an exhibition the Council proposed to have in 1861. Such an exhibition

as that of '51 of course was not contemplated. Another such exhibition, probably, would not occur within 100 years, but an exhibition of a character different from that of 1851,—such as would seem to mark the progress of the time, and give manufacturers and those connected with art and science an opportunity of collecting their productions. For such a purpose he submitted that an interval of ten years was sufficient to elapse between such exhibitions. They were aware that the French, who began with exhibitions 80 years ago, had repeated them every 5 years, and certainly if the people of France saw it was to their interest to hold quinquennial exhibitions, it must be to the interest of this, the greatest manufacturing country in the world, to have similar exhibitions at least every 10 years. Therefore, he had hoped that they should have heard some little word dropped about this matter; but, perhaps, the silence that had been maintained upon it portended some great event that was looming in the distance. He hoped, however, the proposed opportunity of marking the progress of English arts and manufactures would not be lost to this Society and to the country. (Much applause.)

Mr. CHESTER said he had been requested by the Chairman of Council to say a very few words in reply to what had fallen from their colleague in the Council, Sir Joseph Paxton. It was hardly fair, he thought, to find fault with him (Mr. Chester) because he had said nothing about the proposed Exhibition of 1861. It had occupied a large share of the attention of the Council, and what had fallen from Sir Joseph Paxton came with as much force as if it had been stated by any other member of that body. Sir Joseph had told them that he had taken part in the deliberations on this subject, and certainly no one was more entitled than he was to speak upon it, and to act as the mouthpiece of the Council on such a matter. Therefore, all that Sir Joseph had said with regard to an Exhibition for 1861 should be taken as said by him as the representative of the Council, and he had no cause of complaint that the subject had not been introduced on the present occasion by any other member of that body. It was, however, a matter of some difficulty, and required a peculiar organisation. The present Council was near the end of its year of office, and he thought, having drawn up the cardinal features of the plan, those who would have to deal with the affairs of the Society in the ensuing year would most probably deal with this subject of the Exhibition of 1861.

Mr. HENRY THOMAS HOPE said, up to this time they had had toasts which were more especially connected with the proceedings which had taken place during the day at the house of the Society; these, he must say, had been brought forward with a degree of eloquence which he had rarely heard excelled on such occasions. The toast he had to propose was of an abstract nature. It was that they should drink "Success to Arts, Manufactures, and Commerce," which was in itself a subject which even the most eloquent and powerful orators would find it difficult to do justice to within the limits of a speech on an occasion like this. He presumed this toast had arisen from the title which this Society bore. It had been called, for many years, "The Society for the Encouragement of Arts, Manufactures, and Commerce," and he believed the origin of that title dated from a time when Art was less understood and less appreciated than it was in the present day. The noble chairman had enlarged far more eloquently than he could do on the encouragement that art experienced in the present day, and he apprehended that now the duties of the Society were not so much connected with the encouragement of that which might be called high and abstract art, as with the peculiar application of art to manufactures and commerce. He recollected the time—and it was at no very remote period—when gen' men of the highest eminence in art thought it was a certain degree, a compromise of their dignity to

nominate two gentlemen to act as scrutineers of the ballot for the election of officers. He would ask Messrs. W. Atkinson and P. L. Simmons to undertake that office.

These gentlemen having consented to act, the Chairman declared the ballot open. He then called upon the Secretary to read the

ANNUAL REPORT.

In compliance with the terms of the Charter the Council now lay before the members the annual report of their proceedings.

EXEMPTION FROM RATING.

The first subject in order of time is the Bill for amending the laws relating to the exemption of "Mechanics' Institutions and other like Societies" from local rates, which, at the date of the last report, was before the House of Commons. The Bill had been brought before the House of Commons in the instance of the Council, in compliance with the wishes of the Institutions in London. The Bill was not passed; and under the circumstances detailed in the Secretary's report, read last Thursday to the Conference, and already published in the *Journal*, it has not been thought advisable to bring the subject forward again before the House.

BYE-LAWS.

In November last, when the Bye-Laws relating to the appointment of the Board of Examiners were to be acted upon for the first time, it was found that they were not in accordance with the Charter, and the Council therefore suspended action upon them, and took steps for at once calling a general meeting of the Society for altering them, so as to place them in harmony with the Charter. Accordingly on the first day of December a special general meeting was held, and new Bye-laws, proposed by the Council in reference to the appointment of Examiners, were passed unanimously. A full report of this meeting will be found at p. 31 of the present volume of the *Journal*. The Council lost no time in acting upon their amended laws, and appointed a Board of Examiners, who have just completed most satisfactorily the Examinations of the present year.

COMMITTEES.

During the year the Council has sought and obtained the services of several committees on matters of considerable importance.

The subject of Gutta Percha, its great and growing importance in arts and manufactures, has, for some time past attracted considerable attention in reference to its quality, purity, and its liability to decay under certain conditions. The Council have appointed a committee to investigate this subject, and to collect facts in reference to the source of supply of gutta percha, its cultivation,—as well as the circumstances and conditions under which

ANNUAL GENERAL MEETING.

WEDNESDAY, JUNE 30, 1858.

The Annual General Meeting for receiving the Council's Report, and the Treasurers' Statement of Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held on Wednesday, the 30th inst., at 4 p.m., at Wentworth Dilke, Esq., Chairman of Council, presided.

The Chairman, in opening the proceedings, said that by the bye-laws, he was directed to

resists or yields to decay. This Committee has met several times, and has, for the purpose of obtaining facts in connection with this subject, addressed a circular of queries to all, whether in this country or abroad, who are likely to be able to furnish them with information.

Her Majesty's government have undertaken to circulate these queries among the residents in such districts as the Committee have pointed out as likely to have it in their power to supply the information. The East India Company have also most readily consented to act in the same manner as regards their territories.

The East India Company have, at the same time, furnished the Committee with specimens of a substance called "Pauchontee," the product of a tree of the same genus as that from which the gutta percha is produced. It remains to be seen whether this substance can be used as a substitute for, or in conjunction with, the true gutta percha. Experiments to determine this, as well as the nature and causes of the decay or failure in gutta percha, and the nature and effect of adulteration of it, will be undertaken by this Committee. Indeed, a series of experiments have been already devised, and will be commenced forthwith. The Council have much pleasure in recording the liberality of Messrs. Ford Barclay and Edward Highton, and the Submarine Telegraph Company, who have contributed, the two former £25 each, and the latter £10 10s., to assist in defraying the cost of these experiments. This Society naturally feels considerable interest in this subject, the first specimens of gutta percha introduced into this country having been sent here, and the Society's gold medal having been awarded to Dr. Montgomery for its introduction. The labours of this committee must necessarily extend over a considerable period of time, in order to practically test the substance under various conditions, and it is reasonable to expect that very valuable information will ultimately result from them.

The Dutch Government are at present turning their attention to the supply of this article from their possessions in the East, and have sent out a distinguished naturalist to explore those regions in search of it. A specimen of Gutta percha, the produce of Surinam, has been sent to the Society from one of its corresponding members, Dr. Bleekrode, of Leyden.

The subject of Artistic Copyright has been investigated by another Committee appointed by the Council. This Committee has Sir Charles Eastlake, P.R.A., for its Chairman; Mr. J. L. Lewis, late president of the Society of Painters in Water Colours, its Deputy Chairman, with Mr. J. Robertson Blaine, barrister-at-law, for its Reporter, and is composed of eminent Painters, Sculptors, Architects, Photographers, Engravers, Purchasers, Publishers, and others interested in works

of Fine Art. At the request of the Committee, Mr. Blaine drew up a very useful statement in reference to the existing state of the law as affecting copyright on Works of Art, which the Council published and circulated. Queries were also circulated for the purpose of eliciting facts, illustrating the grievances under which artists and the public laboured in consequence of the defective state of the law. These queries soon brought the Committee a considerable amount of information, and they at once proceeded to deal with it. The result was a valuable report, already published in the *Journal*, p. 298, suggesting those remedies to be sought for from the legislature, and these have been embodied in a proposed Bill. A petition, under the seal of the Society, in favour of an amendment of the law of Artistic Copyright, as well as one signed by eighty leading painters, sculptors, architects, purchasers, publishers, and others interested in the Fine Arts, were yesterday placed in the hands of Lord Lyndhurst, who has kindly undertaken to present them to the House of Lords, and move for the appointment of a Committee to inquire into the question, with a view of legislating upon it. Whether this can be accomplished during the remainder of the present session is doubtful, but the subject will come forward early in the next. There are considerable difficulties in dealing with this matter, but the labours of the Society's Committee, the discussion which has there taken place upon every point amongst men so qualified to treat it in all its bearings, resulting in the adoption of a report most carefully considered, cannot fail to have placed the matter in a position more favourable for practical legislation than it has hitherto attained.

The Council has also appointed a Committee to investigate the subject of Mechanical Contrivances applied to Medicine and Surgery—to promote improvement in their production—to determine and make known desiderata—to examine and report on the merit of apparatus submitted, and to recommend rewards for successful inventions. This Committee is presided over by Mr. James Luke, F.R.S., and is composed of a large number of eminent physicians and surgeons. They have divided themselves into sub-Committees under the following heads:

General Medicine.

General Surgery.

Dental Surgery.

Obstetric Surgery.

Ophthalmic Surgery.

Orthopædic Surgery.

Philosophical Apparatus, applied to the investigation and treatment of disease.

Veterinary Surgery.

Dr. Watson, Dr. Budd, and Messrs. Henry Charles Johnson and Richard Partridge, have been chosen Deputy-Chairmen, with Messrs. F.

Seymour Haden and Mitchell Henry, as Reporters of the Committee.

The importance of the establishment of Suburban Galleries of Science and Art has engaged the attention of the Council, who have appointed a Committee to investigate the matter, and report on the practicability of forming such galleries, and supporting such collections not only in suburban districts but in the provinces. This Committee will shortly make its report.

Three years ago the Council appointed a Committee in reference to the expediency of the establishment of a Small Parcels Post. That Committee held several meetings, and by permission of the Postmaster-General, had the opportunity of personally inspecting the arrangements for the receipt and sending out of the letters. The Committee had agreed on the principles of its report, but for reasons which it is unnecessary for the Council to enter upon here, it was considered advisable not to bring the matter forward at that time. The Council have this Session re-appointed that Committee, which has since made its report, and instructions have been given for its publication in the *Journal*. The subject is one of great interest to the public at large, and the Council have decided on inviting the Institutions in Union to express their opinion as to whether the Council should urge upon the Post-office authorities the adoption of the system.

A sum of £20 was, during the session, placed in the hands of the Council by the Rev. F. Trench and J. MacGregor, Esq. (to which the Council added the Society's Medal), to be awarded as a Prize for a Writing Case, suited for the use of soldiers, sailors, emigrants, &c. The attention of the competitors was called to lightness, smallness of size, the avoidance (if possible) of fluid ink, durability, cheapness with a guaranteed supply, and general applicability to the duties, habits, and requirements of the above classes. Sixty-two cases were received in competition, but the Council regret that, after a careful examination of them, none appeared to possess sufficient merit to justify them in awarding the prize.

The Council have determined to invite a further competition, and the conditions will be shortly announced.

During the last few days the Council has had communicated to them a process, the invention of an Englishman, for the production of the metal Aluminium, at a very reduced cost, such a cost, indeed, as will enable the metal to be brought into the market at a price which would admit of its being largely used, either in substitution of higher-priced metals, or for purposes to which such metals now are inapplicable by reason of their weight. A small committee has been appointed to investigate the process and report on its efficiency. It is needless for the Council to dwell on the importance of

the cheap production of a metal possessed of such valuable qualities as Aluminium.

FINANCIAL PRIZE ESSAY.

The Society will recollect that one of its members, Mr. Henry Johnson, some time since, placed in the hands of the Council the sum of two hundred guineas as a prize to be awarded for "The best essay on the present financial position of the country as affected by recent events, in which the principle of a sinking fund should be discussed, and also an investigation made as to the best mode of gradually liquidating the National Debt." Twenty-two Essays have been sent in competition. The Council appointed three adjudicators to award the prize. Professor Charles Neate, of Oxford, Professor Waley, of University College, London, and Mr. J. T. Danson, Fellow of the Statistical Society. The Council had hoped that they might have been enabled to have reported the results of these gentlemen's labours, but there still remain some essays to be read, and the decision is therefore delayed. The award will, however, be made shortly, and as soon as it is, the decision will be announced in the *Journal*. The Council cannot quit this subject without reporting the continued liberality of Mr. Johnson, who has placed in the hands of the Council a further sum of seventy-five guineas for the purpose of placing in the hands of each adjudicator a fee of twenty-five guineas for his trouble in deciding on the merits of the competing Essays.

MARINE ALGÆ PRIZES.

The Council, in their report of last year, informed the members that prizes of £50 and £20 respectively, had been placed in their hands by Sir W. C. Trevelyan, Bart., to be awarded for "The two best and approved Essays on the applications of Marine Algæ and their products, as food or medicine for man and domestic animals. Competitors must give the results of their original investigations on sea-weeds (especially on the chemistry of their nutrient principles); and they must prepare a series of specimens illustrative of the best modes of collecting, preserving, and preparing the nutritive species in a state fit for food. Mere compilations will not be admitted to competition." The Council regret to say that at the time appointed no essay was sent in. Dr. McGowan, of Ningpo, in reference to this subject, presented to the Society a series of specimens of algæ, as prepared for use by the Chinese. A notice of them appeared in the *Journal*. An interesting communication, by Mr. P. L. Simmonds, on the Economic Uses of the Marine Algæ, will be found at p. 362, in the last volume of the *Journal*.

COLONIALS.

During the past session the Council have received from the Chamber of Commerce in West-

ern Australia specimens of dried raisins and olive oil, the produce of that colony. Both have been reported upon by gentlemen engaged in the importation of such articles, and they are pronounced to be of a high character.

ADDRESS TO H.R.H. THE PRESIDENT.

On the occasion of the marriage of Her Royal Highness the Princess Royal with His Royal Highness the Prince Frederick William of Prussia, the Council called upon the Society and the Institutions in Union to join in an address of congratulation to His Royal Highness the President. The address, with upwards of ten thousand signatures attached to it, was presented to H.R.H. by a deputation of about two hundred members of the Society and Presidents of the Institutions in Union, headed by Mr. O. Wentworth Dilke, the Chairman of the Council. His Royal Highness was pleased to receive the Deputation most graciously, and to make a reply which has already been published in the *Journal*.

EXHIBITION IN 1861.

The Council have had under their anxious consideration, at several meetings specially summoned, the benefits to be derived from periodical Exhibitions of Industry and Art, and have come to the following resolutions:—

The Council of the Society of Arts, bearing in mind the part which the Society took in originating the Great Exhibition of 1851, have considered it to be their duty carefully to examine various suggestions for holding an Exhibition in 1861, which have been submitted to them, and have resolved:—

1. That the institution of Decennial Exhibitions in London, for the purpose of showing the progress made in Industry and Art during each period of ten years, would tend greatly to the "Encouragement of Arts, Manufactures, and Commerce."

2. That the first of these exhibitions ought not to be a repetition of the Exhibition of 1851, which must be considered an exceptional event, but should be an Exhibition of works selected for excellence, illustrating especially the progress of Industry and Art, and arranged according to classes, and not countries; and that it should comprehend Music and also Painting, which was excluded in 1851.

3. That Foreigners should be invited to exhibit on the same conditions as British Exhibitors.

4. That the Council will proceed to consider how the foregoing resolutions can be best carried into effect.

After publishing these resolutions, the Council did not consider it necessary, as their year of office was nearly expired, to take further steps, being of opinion that such steps devolved more appropriately on their successors.

EXHIBITION OF INVENTIONS.

The Tenth Annual Exhibition was opened on Easter Monday, and the Council have great pleasure in informing the members that the Exhibition was of an improved character, and that a much larger number of Exhibitors came forward than in previous years. The Exhibition was visited by upwards of five thousand persons.

CONVERSAZIONI.

Two Conversazioni have been held during the session, one at the Society's House, during the Exhibition of Inventions, and the other at the South Kensington Museum. This latter was attended by members and their friends, ladies as well as gentlemen, and two thousand two hundred and eighty persons were present. The Council have taken occasion to address to the Lords of the Committee of Council on Education, under whose charge the Museums at Kensington are placed, a letter, in which they availed themselves of the opportunity to state how highly, on public grounds, and in the interests of "Arts, Manufactures, and Commerce," the Society appreciates the wise liberality which has characterised the regulations laid down by the Committee of Council in respect of the public uses of the Museum at South Kensington, open on certain evenings of each week to the general public, free of charge; on certain other evenings of each week it may be visited at a small expense by Societies which promote Art, Science, or Education.

The creation and maintenance of museums and similar establishments, at the expense of the public, can only be justified when they are open as fully and freely as possible to the use of the public; and there are large masses of persons, quite capable of profiting by visits to museums, who are practically debarred from using them if they are closed during the evening. The Council expressed its earnest hope that the success of the great experiment which their Lordships had tried, might lead to the adoption of the same wise liberality in other departments.

MULREADY DRAWINGS.

The members of the Society may be reminded that a few years since the Society of Arts proposed to assist in the formation of a National Gallery of Art, and to raise funds for that purpose by holding annually an exhibition of the works of some one living artist. At that period there were few if any pictures of living artists in the National Gallery. Mr. Vernon, Mr. Turner, and Mr. Sheepshanks, had not then presented collections. In 1848, the works of Mr. Mulready, R.A., were exhibited by the Society, but the surplus funds, after the payment of the expenses, did not amount to a sum sufficient for the purchase of a picture by Mr. Mulready, as had been intended in the first instance.

Mr. Mulready, in the course of the present session, has, however, with great liberality, presented to the Council three drawings from the life, two in chalks and one by the pen, in return for the surplus which was handed to him, a sum wholly inadequate as representing the value of the drawings, which by competent judges are pronounced to be studies which have been rarely equalled in modern times. The Council offered

is compared with last, also tends to swell the amount.

While the Council point with satisfaction to the present financial position of the Society, they desire to call the attention of the members to the fact, that there has been a decrease in the actual number of members on the books, rising not so much from an increase in the proportion of those who, from death or otherwise, cease to be connected with the Society, as from a smaller number of members having during the last year been added to the list. The Society has never been more active, and the Council write the members generally to use their best exertions to increase the number on the Society's register.

Though not strictly belonging to the financial statement of the present year, and not included in it, the Council cannot pass over in silence the bequest of £100 made to the Society by the late Richard Horsman Solly, Esq., one of the oldest, and, until of late, one of the most active members of the Society. This legacy, less 10 per cent. duty, has been received since the closing of the accounts. A notice of Mr. Solly appeared in the *Journal* at the time of his death, which renders it unnecessary now to repeat what was then said.

The Secretary then read the Treasurers' statement of the Receipts, Payments, and Expenditure during the past year, which was published in the last number of the *Journal*, page 498.

Mr. EDWARD HIGHTON moved the adoption of the report, which was seconded by Mr. C. MASTERS.

Mr. F. LAWRENCE said, he wished to propose an amendment, to the effect that the meeting, while adopting the report, desired to express a hope that in the next session more attention would be devoted to the encouragement of arts, Manufactures, and Commerce, than, as he gathered from the report which had just been read, had been the case during the session just closed. He considered, looking at the balance-sheet, that too large a portion of the funds of the society had been devoted to the educational branch. He did not object to education forming one of the Society's objects, but he thought it ought not to engross so large a portion of its attention and funds. The energies of the council seemed to be almost entirely devoted to this subject, whilst the promotion of arts, science and manufacture was left almost exclusively in the hands of the committees. As an illustration, he could refer to the small sum spent by one of these committees—that engaged upon the subject of Gutta Serena, which he believed had only met once, and had done little or nothing.

Mr. EDWARD HIGHTON, as Chairman of the Gutta Serena Committee, could not allow this statement to pass uncontradicted. The Committee had held many meetings, and had prepared and circulated, extensively, both at home and abroad, such papers as they considered necessary for obtaining the information they desired. They had already received valuable information from the East India Company and other sources, and had arranged a series of experiments which would probably extend over several years.

Mr. HARRY CHESTER said that, so far from the subject of education occupying the whole attention of the Council, he, for his own part, being specially interested in that

question, often found it extremely difficult to obtain the ear of the Council when desirous of bringing forward matters relating to it, so much was their time taken up with the other objects of the Society. He might point to the resolutions passed in reference to the intended Exhibition in 1861, the discussion upon which alone had, he could assure them, taken up the whole of several unusually prolonged Council meetings.

The CHAIRMAN gave an account, in some detail, of the proceedings of the several committees, through which means only was it possible that the multifarious objects of the Society could effectually be carried out. He drew particular attention to the Artistic Copyright Committee, which had held fourteen meetings, and the importance of whose labours could hardly be overrated.

Mr. P. L. SIMMONDS called attention to the important influence which was exercised by the society through its Premium List. He had thought in former years with Mr. Lawrence, that the Society had devoted an undue share of attention to the subject of education, but he was of opinion that during the past session this charge could not fairly be brought against the council. He was aware how much had been done with a view to obtain information in reference to the products of our Colonies, and if the circulation of the Premium List failed to elicit that amount of response which might have been reasonably anticipated—the council were certainly not to blame. Bearing in mind the peculiar circumstances in which the present council and its chairman had been placed at the commencement of the session, he thought, for his part, that they had done their work well, and he was sure the Society would feel that great praise was due to them.

Mr. LAWRENCE said that nothing was further from his intention than to raise dissension in the meeting. He had only brought forward his amendment in order to afford opportunity for discussion, and he now desired to withdraw it.

The CHAIRMAN then put the motion to the meeting, when the report was unanimously adopted.

Mr. THOMAS WINKWORTH said he believed he was the oldest member of the Society present, and having had the opportunity, as one of its vice-presidents, of observing the zeal and intelligence with which the Chairman of Council had performed the duties of his office, he thought the meeting ought not to separate without expressing their thanks to him in a formal resolution.

The CHAIRMAN here interposed, stating that he thought the course Mr. Winkworth was taking was irregular, and tended to establish an undesirable precedent.

Mr. WINKWORTH thought the peculiar circumstances of the case justified him in pressing the motion; he should therefore move

That the cordial thanks of this meeting be given to C. Wentworth Dilke, Esq., Chairman of Council, for his valuable services and unremitting attention to the interests of the Society during his period of office.

Mr. MATTHEW MARSHALL, in seconding the resolution, desired to take the opportunity of his own retirement from the Council to bear his testimony to the very remarkable manner in which their chairman had devoted himself to the interests of the Society.

Mr. HARRY CHESTER desired to express his cordial concurrence in this resolution.

Mr. F. LAWRENCE wished also to express his high appreciation of Mr. Dilke's valuable services to the Society.

Mr. ATKINSON spoke to a similar effect.

Mr. WINKWORTH then put his motion to the meeting, and it was carried by acclamation.

The CHAIRMAN acknowledged the compliment which had been paid him.

It was then moved, seconded, and resolved,

That it be recommended to the Council to present to the Institutions in Union, a copy of the speeches

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It now only remains to reduce all the farthings in 1 ling, from $\frac{1}{4}$ d. to $\frac{11}{16}$ d., 47 in number, into their equivalent value in mills, which may be done by the following rule:—

All sums from $\frac{1}{4}$ d. to $\frac{2}{4}$ d., or from 1 to 11 farthings inclusive, must be reckoned equal to the same number of ls, which each of them exceeds only by $\frac{1}{4}$ th part of its own value.

All sums from $\frac{3}{4}$ d. to $\frac{8}{4}$ d., or from 12 to 35 farthings inclusive, must be reckoned equal to the same number of ls + 1, that is, to from 18 to 36 mills, 1 being the correction necessary for reducing the farthings into mills.

All sums from $\frac{9}{4}$ d. to $\frac{11}{4}$ d., or from 36 to 47 farthings inclusive, must be reckoned as the same number of mills 2, that is from 38 to 49 mills, 2 being the correction necessary in this case.

Hence, 2s. $\frac{2}{4}$ d. will be equal to 100 mills + 10 farthings, or to 110 mills.

3s. $\frac{3}{4}$ d. will be equal to 150 mills + 15 farthings = 165m. + 15m. + 1m., 1 being the correction necessary reducing the farthings into mills. Total, 166 mills.

2s. $\frac{7}{4}$ d. will be equal to 600 mills + 30 farthings = 630m. + 30m. + 1m., 1 being the correction necessary in this case. Total, 631 mills.

3s. $\frac{10}{4}$ d. will be equal to 650 mills + 41 farthings = 691m. + 41m. + 2m., 2 being the correction necessary in this case. Total, 693 mills.

4s. $\frac{4}{4}$ d. will be equal to 900 mills + 18 farthings = 918m. + 18m. + 1m., 1 being the correction necessary in this case. Total, 919 mills.

5s. $\frac{10}{4}$ d. will be equal to 950 mills + 43 farthings = 993m. + 43m. + 2m., 2 being the correction necessary in this case. Total, 995 mills.

TYPE MAP.

A telegraphic map of Europe, entirely executed in type, has been presented to the Society by Mr. R. K. of the Royal Printing Office, Berlin. It is the work of Mr. A. Mahlan, who is employed by Mr. Decker at the above establishment. It is remarkably clear and beautiful. The process by which it has been produced is described as follows:—The drawing of the map, made upon paper, is blackened at the back with a carbonic tracing medium, and is placed, blackened side downwards, on a surface composed of quadrats, formed each by six nonpareil squares, and by means of a point the lines are transferred to them. The quadrats over which the lines are traced are then exchanged for nonpareil type, with a face of points, and the coast line is formed by the inner portion of these points being cut away. The graphic lines are formed of brass rules, fixed in nonpareil type body, as a sort of legs, which can be inserted in the composition, when needed, by taking out the first, the legs being so adjusted in length that the top edge of the rule is level with the face of the type. The additional shading of the coast line is effected by the use of nonpareil type cast with points on the face. The names of places are inserted by means of type taking the place of the quadrats where required.

The effect produced is peculiarly good. How far this is likely to supersede the present methods of producing maps by engraving and transfer to lithographic stone, is questionable; no details as to the cost are given, and it is very doubtful (however simple the process appears), whether the method is satisfactorily produced except at a considerable expense. The labour must be adequately

Home Correspondence.

ELECTRO-MAGNETISM AS A MOTIVE POWER.

SIR,—In the paper read before the Society some time since, by Mr. Thomas Allan, this subject does not appear to have had fair play, either from the author of the paper or from the several gentlemen who took part in the discussion. Mr. Allan did not bring out in sufficient prominence his improvements in electro-magnetism, and in his mechanical appliances for the most effective application of the power obtained; consequently, the discussion was not directed, as it probably otherwise would have been, to the consideration of those points which most vitally affect the success of electro-magnetism as a motive power.

The remarks of the gentlemen who took part in the discussion could not be said to be altogether unfriendly, although they appeared to be generally of a depreciatory character. Perhaps, after all, this highly conservative spirit or strong bias in favour of existing systems, and to depreciate new inventions, may be one of the wise provisions of nature, inasmuch as inventors are stimulated to redouble their exertions much more effectually by opposition, than they would be by the most flattering encomiums passed upon their ingenuity.

Unfortunately, however, the discussion upon Mr. Allan's paper did not so grapple with the real merits of the subject as to show any points to which his attention might be directed, with a view to future improvements.

Mr. Hearder's remarks were principally directed to the law of the squares, but however desirable it may be as a theoretical problem to ascertain precisely in what ratio the magnetic power decreases by an increase of distance, still the solution of this problem had nothing whatever to do with Mr. Allan's paper.

Mr. Siemens is too great a lover of science intentionally to throw any impediment in the way of improvement. He, however, made an objection to Mr. Allan's mechanical arrangements, which does not appear to be very sound. He stated that a "serious loss of power resulted from the sudden stoppage of the armatures in their descent." A locomotive travelling at the rate of sixty miles an hour with a five feet driving wheel, will not only stop the motion of the piston, but reverse the motion nearly twelve times in a second. In Mr. Allan's machine the motion is stopped but not reversed, so that, in this respect, his machine has an advantage over the reciprocating motion of the steam piston, and it does not appear that Mr. Siemens' objection really has much weight, although it had its effect upon the audience.

Several of the gentlemen who took part in the discussion were anxious for data, to institute a comparison with the steam-engine in its highly improved state. This extravagant expectation cannot at present be gratified. Would it not be more reasonable to compare the most advanced electro-motive machine with the steam-engine when Watt took it in hand, and before he had found a Bolton to assist him with capital? Had Watt not found a capitalist, he might have died and made no sign, and the gigantic improvements resulting from his genius would have remained undeveloped.

The machine which Mr. Allan brought before the Society of Arts was the first of the kind which he constructed, and it necessarily has many of the imperfections of a first attempt. Mr. Allan has materially improved his mechanical and electrical arrangements, and I cannot but think there is here an excellent opportunity for some capitalist who may be ambitious to associate his name with the solution of one of the greatest practical problems of the age.

The question is confessedly a very great one, and admits of a division of labour, and if chemists would direct their attention to the discovery of a cheaper subst

BOLTON MUSEUM.

On 26th June, 1858, the visitors were Mr. R. K. of the Royal Printing Office, Berlin. On Monday, Tuesday, and Wednesday, on Monday and Tuesday On the three Students' days (Ed.), 989; one Students' evening, 7,156.

to supersede the zinc in the battery, a material point would thus be gained.

I think the three following improvements may be justly claimed by Mr. Allan, though they were very much lost sight of in the discussion:—

1st. The application of the magnetic force direct and not tangentially.

2nd. The use only of the most powerful portion of the geometric curve formed by the rapidly decreasing magnetic power in proportion to distance.

3rd. The continuation of motion or stroke in the same direction over any required space by means of successive groups of magnets.

I am aware that these points cannot well be understood without an explanatory diagram, but I will endeavour to explain how a model might be constructed which would illustrate these three points.

Let us suppose that three groups of four magnets each will be sufficient for illustration. Cotton reels will very aptly represent magnets with the wire coil; four reels gummed on to a card placed in such a manner as to form a square, but not quite touching each other. Let three of these be formed to represent three groups of magnets, and place them in a frame, so that there shall be rather more than two inches between the first and second, and rather more than three inches between the second and third, numbering downwards. Pierce a hole in the centre of the square formed by each set of reels and pass a slight straight piece of wood, about the substance of a black lead pencil, but longer, through these holes. Cut out three cardboard circular discs, sufficiently large to extend over the ends of the four reels, forming a group, and through a hole in the centre of these discs pass the piece of wood, and place stops upon it by passing a short pin through it, or otherwise, so that the discs may not pass below these stops, but the stops must be made so as to pass through the card to which the reels are attached, and the stops must be so arranged as to distance, that when the discs are placed upon the rod, and the rod passed through the several groups of reels, the upper disc will be one inch above the upper group of reels, two inches above the second group, and three inches above the third group. The apparatus being thus arranged, let us suppose that the upper group of electro-magnets are magnetised, and attract and pull down the upper disc to the upper surface of the first group of magnets, when the electricity is cut off, and as this motion of the vertical rod brings the second disc within one inch of the surface of the second set of magnets, these are then magnetised, and pull down the second disc, and so on to the third, or any greater number of groups of magnets, and thus the motion is continued in the same direction, until any required length of stroke is obtained.

As the philosophy of common things is now so much talked of, I hope this familiar illustration will be excused, and the three principal improvements effected by Mr. Allan be made apparent. That is the direct action of the magnet upon the body attracted, that action only passing through the most powerful range of the magnetic influence, and thus economising battery power, the motion being continued in the same direction, through any given number of groups of magnets, until it is made to pass over a sufficient space to be mechanically useful.

I am, &c.,

ALEXANDER DOULL.

Proceedings of Institutions.

CHATHAM.—The twenty-first annual report of the Committee of the Chatham, Rochester, Strood, and Brompton Mechanics' Institution states that while on former occasions they have been compelled to direct attention to its waning fortunes, they can now heartily con-

gratulate the members upon the success of their efforts, and can point to a vigorous and thriving Institution, which has enlisted in its support the sympathy and good wishes of the inhabitants of the several towns, and which they believe has not even reached the zenith of its power and influence, but which is destined in their opinion steadily, yet certainly, to advance. The past year has indeed been a most important one in the history of the Institution; its most pressing want, that of a suitable public lecture hall, having been supplied by private enterprise. From the time of the removal of the Institution to the premises at present occupied, its progress has been a very marked one,—the number of members has been nearly doubled, being in the first quarter 402, whilst in the last quarter the number was 670. The income has increased proportionably, and the Committee have consequently been enabled to provide a class of lectures and entertainments vastly superior to those hitherto given. The Committee take the opportunity of expressing the deep gratitude they feel to their distinguished president, Charles Dickens, for the invaluable service he has recently rendered to the Institution: not only has he placed at their service the influence of a name, "familiar as household words" to all true lovers of English Literature but he has also, in addition, given a public reading for the benefit of the Institution, the proceeds of which amounting to nearly one hundred pounds, the Committee have resolved to devote to the improvement of a long-neglected appliance of the Institution, by investing the amount, after the bookcases have been paid for, in the purchase of a large number of valuable and standard works, to be added to the existing library. The Committee feel that they shall be acting in accordance with the wishes of the members, and at the same time perpetuating, in the most enduring manner, the remembrance of the deep obligations they are under to their president. The Committee, at the same time, gratefully acknowledge the receipt of valuable presents of books from Mr. R. Winch, jun., Mr. Jas. Austin, Mr. Tidyman, and J. Drummond, Esq.

DARTMOUTH.—The committee of the Literary Institution, in presenting their report of its proceedings during the past session, state that they do so with feelings of unmixed satisfaction. In establishing a society of this kind, the second year is rightly considered the time of trial, and when there appears no falling off in the number of members, but, on the contrary, a marked increase, whilst that warm interest which was evinced by the town generally at the outset, is still continued, it may safely be concluded that the Institution has acquired sufficient strength to warrant the most sanguine anticipations of its permanence. A large increase has taken place in the number of subscribers, the number last year being 288, and in the present year 275. Many volumes have been added to the library, both by donation and purchase—and the number of periodicals and papers in the reading room has been considerably extended. At the same time the best attention of the committee has been given, not only to the economical expenditure of the funds, but also to the character and utility of the works introduced. Classes also have been formed, which the committee hope will yet receive fuller development, as they feel satisfied that the institution of classes constitutes one of the most useful spheres of operation in societies of this description; the attendance also on the lectures has been most satisfactory, showing an average of 165 persons at each lecture. The numerical increase has been chiefly amongst the ordinary and quarter subscribers, for whose use, more especially, the reading room and library were required. The committee, taking into consideration that many persons join the Institution with the sole object of attending the lectures, have thought it necessary, in some cases, to avail themselves of the services of lecturers from a distance, men of known talent, who are in the habit of addressing large audiences. It is, however, a matter of regret that on all these occasions

the expenses of the evening have very considerably exceeded the receipts. The committee propose during the ensuing session to engage the services of such men as Mr. Pengelly, of Torquay, or Mr. Hearder, of Plymouth, to deliver consecutive lectures on popular subjects, deeming such a course more advantageous and instructive than lectures on a variety of subjects. The very great success that has hitherto attended the Institution has however its difficulties; the society has, in fact, outgrown its present accommodation, and it is proposed to raise by subscription a sufficient fund to erect a building capable of affording the necessary lecture and reading rooms. The French class has been in operation since November last, under the supervision of Mr. St. Dalmas, and at present numbers sufficient members to render it most self-supporting, so that it requires but little aid from the funds of the Institution. A class for the study of natural history in connection with the microscope is forming, and only requires a small contribution for incidental expenses from persons inclined to join, to commence operations forthwith. Through the kindness of one of our friends, a handsome microscope was twelve months ago placed at the disposal of this class. An addition of 10 volumes has been made to the library; 26 of these were presented by Mr. Kensington, to whom the thanks of the society are due for his kindness on this as well as many other occasions. Mr. Windeatt and the president have also been contributors of books. The issue of books for the past six months has been 2000.

MEETINGS FOR THE ENSUING WEEK.

-Entomological, 8.
-Astronomical, 8.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

- No. *Delivered on 22nd June, 1858.*
- Bills—Confirmation of Executors, &c. (amended).
 - Public Health (amended).
- Delivered on 23rd June, 1858.*
- (1). Pridenax's Furnace-Valve Door—Return.
 - Contracts (Public Departments)—2nd Report from Committee.
 - Bills—Piers and Harbours.
 - Wills of British Subjects Abroad (No. 2).
 - Smoke Nuisance Abatement (Metropolis).
 - Chief Justice of Bombay.
- Delivered on 24th June, 1858.*
- Brewers, &c.—Account.
 - London Corporation (Receipts and Expenditure)—Return.
 - Bed of the Sea, &c.—Return.
 - Bills—Vaccination (Ireland) (amended).
 - Medical Practitioners (amended).
- Delivered on 25th June, 1858.*
- (1). Trade and Navigation Accounts (31st May, 1858).
 - Ballindine National Schools—Correspondence.
 - Belsham Constabulary—Copy of Report.
 - Bills—Sale of Grain, &c.
 - Four Courts (Dublin) Extension.
- Delivered on 26th and 28th June, 1858.*
- Property Tax and Population, &c.—Return (a corrected Copy).
 - Receipt and Draft Stamps—Return.
 - Navv—A tributary of Returns.
 - Colonisation and Settlement (India)—2nd Report from Committee.
 - Bills—Letters of Credit.
 - County, &c. Property Conveyance.
 - Probates and Letters of Administration Act Amendment.
 - Divorce and Matrimonial Causes Act Amendment.
 - Herring Fisheries (Scotland).
 - New General Post-office (Edinburgh) (as amended by the Select Committee).
- Delivered on 29th June, 1858.*
- East India (Doona)—Return.
 - Assizes (Scotland)—Copies of Reports.
 - Marshot Hospital—Copy of Report.
 - Accidents on Railways—Report from Committee.
 - Refugees of Refuge—Report from Committee.
 - Local Acts (38. Sunderland Dock Bill, No. 2)—Admiralty Report.
 - Clerk of Petty Sessions (Ireland) (amended).
 - Cagliari—Further Correspondence.

Delivered on 30th June, 1858.

- 338. Metropolitan Board of Works—Returns.
- 346. Army, &c. (Receipt and Expenditure 1856-7)—Account.
- 162. Bills—Wills and Domicile of British Subjects Abroad, &c.
- 163. Copyhold Acts Amendment (amended).
- 164. Pauper Lunatics.
- 164. Bankruptcy and Insolvency.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, June 25, 1858.]

- Dated 17th May, 1858.*
- 1022. W. Duff and J. Glichrst, Liverpool—Imp. in apparatus for measuring water and other fluids, also capable of being used as a motive power.
- Dated 21st May, 1858.*
- 1138. W. Clark, 53, Chancery-lane—Imp. in the processes of treatment of peat, and of the hydro-carburets it contains, and in the apparatus for the same. (A com.)
- Dated 26th May, 1858.*
- 1168. P. Griffiths, Manchester-road, Burnley, Lancashire—Imp. in manufacturing bushes for fixing drums on shafts, and other similar purposes.
- Dated 26th May, 1858.*
- 1178. J. Luis, 18, Welbeck-street, Cavendish-square—An apparatus for cutting square-headed corks, and for corking bottles with the same. (A com.)
- Dated 27th May, 1858.*
- 1192. W. Clark, 53, Chancery-lane—Imp. in preserving butter. (A com.)
- Dated 29th May, 1858.*
- 1208. J. Shuttleworth, Stamp End Works, Lincoln—Imp. in portable and other steam-engine boilers.
 - 1210. W. Hodgson and H. Hodgson, Thornton-road, Bradford—Imp. in machinery or apparatus for preparing and spinning, or producing motley yarns from rovings of unequal thicknesses of wood or other fibrous substances.
 - 1212. S. Rockett and J. J. Reynolds, Strand—Imp. in the manufacture of umbrellas and parasols.
- Dated 31st May, 1858.*
- 1220. J. B. Thorndyke, Halifax—Imp. in carriages for children, commonly called "perambulators," which improvements are also applicable to invalid and other carriages.
 - 1222. G. K. Snow, Watertown, Massachusetts, U.S.—A new and useful machine for affixing postage stamps to letters.
 - 1224. H. Jaeger, Paris—Imp. in dyeing wool. (A com.)
 - 1226. J. Austin and J. Armstrong, Wellington, Salop—An imp. or imp. in the manufacture of oaks.
- Dated 1st June, 1858.*
- 1228. A. Barchou, 22, Cranbourn-street, Leicester-square—A heel for boots and shoes.
 - 1230. A. G. Grant, New York—A method of preparing paper in order to render it waterproof, and adapted for the reception of photographic pictures.
 - 1232. R. W. Chandler, Bow, and T. Oliver, Hatfield, Hertfordshire—Imp. in agricultural apparatuses for ploughing and otherwise operating upon land.
- Dated 2nd June, 1858.*
- 1234. F. J. Candy, Haslemere, Surrey—Imp. in machinery for the manufacture of fishing and other nets.
 - 1236. J. Luis, 18, Welbeck-street, Cavendish-square—A new farming implement, called the gleaner. (A com.)
 - 1238. D. Service, Barrehead, Renfrew, N.B.—Imp. in apparatus for producing printing surfaces.
 - 1240. H. Brown, B. Hodgson, and J. Carter, Halifax—Imp. in machinery for introducing and withdrawing wires when weaving.
 - 1242. R. Roberts and W. Shaw, Heaton Norris, Lancashire—Certain imp. in looms for weaving.
- Dated 3rd June, 1858.*
- 1244. J. Melkirk, Dalkeith, N.B.—Imp. in boilers for heating water, and in valves for controlling and regulating the flow or passage of the same.
 - 1245. R. Owen, Manchester—Imp. in water-closets, night commodes, or similar conveniences, and also in disinfecting processes.
 - 1246. W. Clayton and J. Goodfellow, Blackburn—A certain imp. in pistons for pumps.
 - 1247. J. Bethell, 8, Parliament-street, Westminster—Imp. in the manufacture of alum.
 - 1249. A. V. Newton, 66, Chancery-lane—An improved manufacture of woven fabric, applicable chiefly where strength and durability are required. (A com.)
 - 1250. G. Dalton, Lymington—Imp. in furnaces for smelting the ores of iron and other minerals.
 - 1251. J. Mitchell, Dunning's-alley, Bishopsgate-street Without—Imp. in purifying paraffine.
 - 1252. R. Owen, Rotherham, Yorkshire—Imp. in the manufacture of railway wheel tyres, and in machinery employed therein.
 - 1253. H. Edwards, Dalston—An improved pipe stem or tube.
 - 1254. T. Wilson, Bradmore-house, Chiswick—Imp. in the construction of mangles.
 - 1256. J. Baron Von Liebig, Munich—Imp. in protecting the silvered surface of mirrors and other articles of glass.

Dated 4th June, 1888.

1266. W. Hargreaves and M. Halsey, Bradford—Imp. in machinery or apparatus for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.
1267. E. M. Stoeck, Manchester—Certain imp. in looms for weaving. (A com.)
1268. J. F. Dickson, 6, Russell-street, Litcham, near Derby—Imp. in the permanent way of railways.
1269. V. Merigli, Paris—Means for preventing dust on rail-roads.
1270. V. Merigli, Paris—Means for impeding and exhausting fumes on railway trains.
1271. T. Crick and J. T. Crick, Leicester—Imp. in the manufacture of boots, shoes, and slippers.
1272. R. Quin, 5, Rodney-street, Pentonville—Imp. in ordnance and fire-arms.
1273. R. A. Brooman, 166, Fleet-street—Imp. in preparing the fibrous portions of certain textile plants, and the employment thereof when prepared either alone or in combination with articles already in use for the purposes of stuffing. (A com.)

Dated 5th June, 1888.

1265. J. Banks, Liverpool—An improved reaping machine.
1266. M. Page, Valdoie, near Belfort, France—A steam or power kneading apparatus.
1267. H. Carter, Manchester—Imp. in gas burners.
1268. C. Hancock, West Ham Gutta Parcha Company, West-street, Smithfield—Imp. in the manufacture of electric telegraph cables.
1269. E. Cooke and G. Dickinson, Smethwick, Staffordshire—Imp. in the manufacture of metallic and other bedsteads, and other articles for sitting, lying, and reclining upon.
1270. R. Orr, Glasgow—Improved apparatus to be applied to various machines used in the manufacture of yarn or thread.
1271. A. Manbré, Rathbone-place—An improved method of preparing malt and other grain, and in preparing the machines matter therefrom, whether for the purposes of brewing, distilling, or otherwise.
1272. F. H. Whiteman, 28, Essex-street, Islington—Rendering paper hangings, for decorating the interior of houses, capable of being washed by soap and water without detriment to the colours thereof.
1273. W. Porter, 9, Leaden-villa, Brompton—Imp. in artillery ordnance, and some other descriptions of fire-arms.
1274. G. Hadfield, Carlisle—Imp. in the protection of carboys or other vessels and packages.

Dated 7th June, 1888.

1275. E. Sooton, Clayton, and H. Charley, Grimsby-street Foundry, Preston, Lancashire—Imp. in machinery connected with traction and other engines, and in endless railways, to be used therewith.
1277. J. Ferrabos, Thrupp, near Stroud—Imp. in machinery for cutting, collecting, and spreading grass, and for sweeping.
1276. J. J. Rowley, Hawthorne, near Chesterfield—Imp. in apparatus for applying lime, soot, and other matters to turnips and other crops, and manure to land.
1278. J. Boullenger, and L. J. Martin, Paris—An apparatus serving to the decomposing neutral fatty substances into fatty or oily acid and glycerine.
1280. J. M. Dunlop, Manchester—Imp. in apparatus for sifting fibrous materials.
1281. H. Wimbald, Aldermaston, Berkshire—Imp. in machinery or apparatus for destroying the turnip fly and other destructive insects on growing crops.
1282. E. Vigers, Paddington—Imp. in the manufacture of bricks and other articles moulded or formed from clays.
1283. J. B. A. Lombard and X. T. Esquivon, Paris—A new or improved method of obtaining mucous substances from cereal and vegetable matters, and applying the products obtained to various useful purposes.
1284. E. Hicks, Chatham-place—The manufacture of a composition or compositions to be employed as black lead.

Dated 8th June, 1888.

1285. J. M. Dunlop, Manchester—Imp. in bowls or rollers used in machines for printing fibrous materials.
1287. I. Ketchum, 69, Canning-street, Liverpool—An improved self-acting perforated beater.
1288. R. A. Brooman, 166, Fleet-street—Imp. in the manufacture of copper pipes and tubes. (A com.)
1291. A. Robertson, Sheffield—Imp. in stoves or fire-grates.
1293. D. Iroas, 6, Cornwall-terrace, Creak-road, Deptford—Imp. in the mariners' compass.
1295. A. Rigg, senr., and A. Rigg, jun., Chester—Imp. in apparatus for tipping or upsetting coals, minerals, or other substances, and in brake machinery.
- Dated 9th June, 1888.*
1297. F. A. Gatty, Acerrington—Imp. in dyeing cotton and other fibrous materials and fabrics.
1299. B. Lees, Salford—Imp. in the manufacture of tan or tanning, and in tanning hides to make leather.
1301. E. C. Grimsby, Denton, Lancashire—Imp. in furnaces and steam boilers.
1303. C. F. Vassero, 45, Essex-street, Strand—An apparatus for measuring and registering the flow of liquids. (A com.)
1306. P. Dumont, Southwark-square, Borough—Improved implements for distributing or applying powder.
1307. H. Robinson, Stepney—An artificial fuel.
1308. J. Roberts, Upnor, Kent—An improved construction of reflector or cover for gas burners.
1311. J. Roberts, Upnor, Kent—An improved construction of stove.

Dated 10th June, 1888.

1313. T. W. Mellor and W. Jamieson, Ashton-under-Lyne—Certain imp. in looms for weaving figured fabrics.
1315. J. Lule, 18, Welbeck-street, Cavendish-square—An improved threshing machine. (A com.)
1317. J. Lule, 18, Welbeck-street, Cavendish-square—An improved nose-bag for giving horses their oats, &c. (A com.)
1319. J. S. Crossland, Ashton-under-Lyne—Certain imp. in steam engines.
1321. G. Hall, Saint John's, Worcester—Certain imp. in carriages.
1322. W. Wilkinson, Baywater—Certain new textile and other combined fabrics and means of ornamenting fabrics and skins.
- Dated 11th June, 1888.*
1325. J. Gemmell, Belfast—Imp. in the manufacture of stoves.
1327. L. A. Bigelow, 128, High Holborn—A new and improved machine for sweeping carpeted and other floors. (A com.)
1329. W. E. Newton, 66, Chancery-lane—Improved apparatus for supplying boilers with water. (A com.)
1331. L. F. Lenkire, Cauderan, France—Imp. in treating hemp or tow for the caulking of ships and vessels, parts of which improvements are applicable to washing and cleansing textile articles or fabrics impregnated with greasy or oily matters, and in the apparatus connected therewith.

Dated 12th June, 1888.

1336. J. Hall, Derby—An imp. in the slide valves of steam engines.
1337. A. Gibson, J. Pollock, and J. Martin, Stratford—Imp. in the construction of steam engine boilers and furnaces for effecting the prevention of smoke.
1339. A. V. Newton, 66, Chancery-lane—Improved machinery for cutting veneers. (A com.)

Dated 14th June, 1888.

1341. J. H. Young, 66, Great College-street, Camden-town—Imp. in setting up (compositing) and distributing types.
1343. H. N. B. Sharnpeel, Medway Manor House, Bradford—An imp. in preparing iron and other metals, or mixtures of metals, for and in casting the same in moulds.
1345. J. Hetherington, Store-street Mills, Manchester—Imp. in guides or clearers used in machines for winding, reeling, and clearing threads of cotton, silk, and other fibrous materials.
1347. J. C. Henderson, Albany, U.S.—Imp. in stoves.

Dated 15th June, 1888.

1349. L. C. S. Masson and F. de la Morinie, Paris—Imp. in the manufacture of woven fabrics with coloured patterns.
1351. G. Adshad, Staley New Mills, Staley-bridge, Chester—Imp. in steam boilers.
1353. W. P. Wilkins, Ipswich—Imp. in the arrangements and construction of refrigerating apparatus.
1355. H. S. Warner, Trinidad—Imp. in the manufacture of bleaching and purifying charcoal.
1357. J. Rubery and T. Warwick, Birmingham—Imp. in machinery and tools for making certain portions of umbrellas and parasols and hinges.

Dated 16th June, 1888.

1359. G. T. Bonsfield, Loughborough-park, Eriston—Imp. in apparatus to be used in the construction of small boats. (A com.)
1361. C. W. Lancaster, New Bond-street—An instrument or apparatus for charging cartridges for breech-loading arms.
1363. J. J. Cregeen, Plough-road, Rotherhithe—Imp. in the treatment of India and China grass, pine apple, hemp, flax, and other similar fibrous materials, and in the machinery or apparatus employed therein.
1365. J. C. Hill, Wildon Iron Works, near Abergavenny, Monmouthshire—Improved apparatus for ascertaining and indicating the height of water in steam boilers.
1367. G. Davies, 1, Scire-street, Lincoln's Inn—An improved steam brim slide valve for steam engines. (A com.)

INVENTION WITH COMPLETE SPECIFICATION FILED.

1360. B. Atwater, Connecticut, U.S.—An improved sewing machine.—16th June, 1888.

WEEKLY LIST OF PATENTS SEALED.

June 25th.	
3168. A. Bruce.	769. Hon. W. Talbot.
3169. J. Barling.	900. W. Foster.
3175. T. Spencer.	901. A. Jenkins.
3189. J. D. Morrison.	910. J. Horton.
3198. G. Wilson.	937. W. E. Newman.
6. J. W. Clare.	972. J. H. Johnson.
8. R. Harvey.	992. W. E. Newman.
12. F. Walton.	
40. T. Rowell.	
78. C. A. de Laire de la Brosse.	
83. E. Wilson.	
176. P. Ashcroft.	
260. R. Aytoun.	
450. R. S. Bartlett.	
506. A. V. Newton.	
633. W. Richards.	
748. W. Nimmo.	

June 26th.

3187. F. Palling.	
3188. T. Booth.	
3190. J. O'Neil.	
3192. J. Chatterton.	
3195. H. W. and	
3. L. J. G. G. G.	
7. J. Pally.	
71. R. G. G. G.	
977. V. G. G. G.	

PATENTS ON WHICH THE STAMP D. secures, by

- June 21st.*
1431. W. Teall.
- June 22nd.*
1439. H. N. Penrice.
1480. A. E. L. Bellford.

The Society of Arts.

JULY 9, 1858.

MEMBERS OF COUNCIL.

JULY 7TH, 1858.

At their first meeting this day
Mr. C. Wentworth Dilke, Esq.,
was elected Chairman for the

PREMIUM LIST.

have determined to issue a new
for the ensuing Session. Mem-
bered to forward to the Secretary
relative to desiderata in Arts,
and Commerce.

SMALL PARCELS POST.

appointed by the Council for
the expediency of establishing a
for Small Parcels, have made the

REPORT.

It now stands, every letter is defined to
every parcel transmitted by the post is
letter. The Treasury is restrained from
letters than the rates particularised in
allowed an unlimited discretion as to
at any lower rates which may appear
required by the public convenience and
the revenue. The whole principle of a
and the rates at which it may be best
the public advantage, are by the legislature
committed to the executive govern-

time, when, by the repeal of the newspaper
deficiency has been occasioned in one branch
the Committee hope to show that, by
of the parcel postage, much may be
usually to make good that deficiency, whilst
may be rendered to the public and to the
establishment itself, and even to the chief mail
and railway undertakings.

conveyance of small parcels by the post is not
in principle—at all events to the metropolitan
In 1748, the administration of the penny post
of by De Foe as admirable for the quick-
of the transmission of parcels as well as letters from
to eight times a day: "Nor are you," he says,
up to a single piece of paper, as in the General
office, but any packet under a pound weight goes at
same price." In several of the continental posts a
all parcel post is connected with the letter post.

At present, the small parcel post, strictly so called, is,
this country, in a condition of over-taxation worse
than that of the old letter post. Even the rate for books
so high as to be resorted to only in very special, and,
comparatively to the general book circulation to the
countries, rare cases. The charge, for other things
at 2d. per ounce, or 2s. 8d. per lb., is
for light articles, or articles of very
high value, or for small matters the
extremely important. The

present charge of 2s. 8d. a lb. interposes, in a large propor-
tion of cases, insurmountable barriers to the collection
and transmission of paint-boxes, cases of instruments,
small models, small objects of art, such as those with
which the Society of Arts is conversant. In respect to
the labouring classes especially, the present rate of charge
offers the like obstructions to the transmission and inter-
change of small things and articles which are of high
social value, to those which prevailed under the old
postage system, to trading and family correspond-
ence. A son, in place in London, sends to his
mother, by postage-stamps or money-orders, a por-
tion of his wages; she, in return, might send to him
a pair of knitted stockings, or some piece of her own
work, no larger than a book. A mother may now send
to her son in place or in the army, by the present reg-
ulations, a quarter of a pound of printed matter for a
penny,—she would send him a pair of socks or a "com-
forter," of no greater weight or bulk, but that the charge
at the rate of 2s. 8d. for the pound is prohibitory.
Naturalists would transmit specimens, horticulturists
would exchange seed, farmers would send samples of
corn and cereal produce as often as they now send
letters,—where only very small and unsafe samples are
now given, full and satisfactory samples would be sent;
—tradesmen would transmit small articles to special
customers in remote districts, but for the over-taxa-
tion, or the extreme overcharge—for the service which
ought to be rendered to the public by the public
agency.

The necessary expense of the separate transmission of
small articles to distant places by any existing private
means also in a great majority of cases amounts to a
prohibition. In those cases where no portorage is re-
quired in sending the article to the coach-office, or to
the railway-station, or from the terminus or the coun-
try coach-office to its destination, the transmission of
small articles may be easy, and the charges moderate;
but when there are one, two, or three miles of portage
at one or both ends the expense frequently exceeds the
value of the article which would be sent if the charge
were moderate.

It rarely happens that any fault is to be found with inn-
keepers in respect to their charges for parcel delivery, for
in all those cases where the receivers may live at coun-
try houses two or three miles from the station or the inn,
a porter must be employed for the delivery of that one
parcel alone, and the quarter or half day of the porter's
time and labour must be paid for—and payment must
be made, moreover, for the innkeeper's trouble. But
the post has already an agency, established and paid for,
which may be called a general portorage, for the delivery
of letters, available for rendering separate portorage, to
the inns or the stations, unnecessary over a large part
of the country. The post cart which from Kensington and
Bayswater collects the letter-bags to be conveyed to St.
Martin's-le-Grand, may, without injurious addition to
the weights, carry small articles, for each of which
the sender must now, if the direction be provincial,
get a porter to carry it to the inn or the station,
often at an opposite side of the metropolis. The
postman who goes out from the country town a
mile or two, to a house or village with a handful of let-
ters, might, without inconvenient addition to his labour,
carry a bag of small parcels. It will be found, therefore,
in such cases, that at a payment of 4d. for a parcel
of a lb. weight the post may do at a profit that which
the innkeeper could not do by the payment of the
messenger for the one parcel of a shilling or two
shillings,—an expense of labour which it is not worth
while in the majority of cases to incur, and which
is not incurred.

The instances given are of cases of transmission over
one line of main carriage from which separate portage
at either end is requisite. But when it is requi-
red to send any parcel over cross countries, or very

tances, the changes of carriers and the variations of charges which it is very difficult to ascertain, augment the obstacles to transmission at every change. These obstacles may be illustrated by supposing that a naturalist engaged on the coast at one end of the kingdom wishes to transmit a specimen or a small parcel from the Land's End to John o'Groats or May, the transmission being for the greater part of the distance over large trunk lines of railway, and the private means of conveyance in the highest state of organisation attained, or at present deemed attainable by private means. If, from the great amount of the charge, or from any loss or injury occurring in the transmission, there were occasion to investigate the changes of conveyance, with much labour, and by the aid of directories, they might be found to be as follows:—A small parcel, to be transmitted from the Land's End to May, near Thurso, must be conveyed, 1st, by one foot messenger from the Land's End to St. Buryan; 2, by another foot messenger from St. Buryan to Penzance; 3, from Penzance to Truro by mail cart; 4, from Truro to Plymouth by mail coach; 5, from Plymouth to Exeter by South Devon Railway; 6, from Exeter to Bristol by the Bristol and Exeter Railway; 7, from Bristol to Tamworth by the Midland Railway; 8, from Tamworth to Preston by the London and North Western Railway; 9, from Preston to Carlisle by the Lancaster and Carlisle Railway; 10, from Carlisle to Greenhill by the Caledonian Railway; 11, from Greenhill to Perth by the South Central Railway; 12, from Perth to Aberdeen by the Scottish North-Eastern Railway; 13, from Aberdeen to Keith by the Great North of Scotland Railway; 14, from Keith to Elgin by coach; 15, from Elgin to Inverness by the Inverness and Aberdeen Junction Railway; 16, from Inverness to the South side of the Meikle Terry, near Tuin, by mail; 17, from the South to the North side of Terry by a boat; 18, from Terry to Thurso by mail coach; 19, from Thurso to May by messenger.

Take the case of the need of transmission of a small parcel from the Land's-end to another extremity of the United Kingdom, as to Valencia, in Ireland. It must be conveyed by the seven distinct changes of carriers to Tamworth, and then it must, 8, from Tamworth to Chester by the London and North Western Railway; 9, from Chester to Holyhead by the Chester and Holyhead Railway; 10, from Holyhead to Kingstown by the mail packet; 11, from Kingstown to Dublin by the Kingstown and Dublin Railway; 12, from Dublin to Mallow by the Great Southern and Western Railway; 13, from Mallow to Killarney by the mail car; 14, from Killarney to Cahirciveen by another mail car; and, 15, from Cahirciveen to Valencia by foot messenger.

A parcel from May, near Thurso, for Valencia, must be conveyed by eleven different changes or different carriers to Preston; and from Preston to Chester it would be conveyed by the London and North Western Railway, and from Chester to Valencia by the several changes above mentioned, making in all 19 changes. The members of the Chambers of Commerce of such places as Manchester, Liverpool, Glasgow, Leeds, Bradford, or Birmingham, by drawing lines from their own centres to the remote places of demand, may estimate for themselves the obstacles created by the changes of carriers to the transmission of small parcels. Usually each separate carrier has a separate rate of charges. One of the larger railways has upwards of four hundred different prices, charged, not upon any common scale of weight as for a service, but upon estimates of the necessities of the senders and what, from the nature of the goods, they can be made to pay, as to a monopoly for transmission. The railways are often hostile and not always very accommodating towards each other, in respect to the transmission of each others goods, any more than each others passengers. The difficulty in ascertaining any cause of injury or delay which may occur in the transmission of parcels, is as the number of separate carriers. The larger portion of the

parcel traffic will, of course, be within the shorter distances, but in respect to the smaller parcels, the greater and insuperable obstacles to any private conveyance, it may be expected, will be in the larger distances. On the present occasion no question is intended to be raised as to the effect of the unharmonized machinery of upwards of 50 different and conflicting railway companies, for conveyance upon the larger parcels or goods traffic. In respect to smaller parcels, there is little or no experience of the effects of the multifarious charges upon any attempted transmissions to the longer distances, the general effect being that the charges for them are simply prohibitory. From thence they are only transmitted at very long intervals when a relation or a friend is travelling to town or to the place of destination, and will charge himself with them as part of his baggage.

The transmission of the small parcels of the description in question, by private conveyance, are so few and exceptional that they may be set aside as of no account, and it may be assumed that the great bulk of them are lost to the railway companies;—those that are sent being lost for separate transmission by being comprehended in the passengers' luggage; and those which are not being lost by the operation of the necessarily high prohibitory charge;—any considerable traffic of the kind being, in fact, out of their reach or means of sufficiently moderate charges, by the unavoidable necessary expense of separate portage.

It is submitted that to meet the cases of these small parcels, the public postage service should be further utilized, and that in doing so the public revenue may be improved, with gain rather than loss to the railway. The service needed could not be rendered by any separate establishment or by any other means, so cheaply by the post, in the great class of cases indicated. The establishment charges of the postal agency being already more than paid for by the penny postage upon letters; if we could also have a second distinct and universal system of portage for small articles, the establishment requisite for that separate system must be maintained by an additional payment; and why should the public be put to the additional expense and trouble of an irresponsible and uncertain private agency, when there is a public and responsible agency already established which is available for the purpose? In a great number of cases, as already stated, the unavoidable expense of the second agency must, under any circumstances, be prohibitory for all but parcels of a great weight or of a high value, or very special character to make it worth while to pay for it as for an extraordinary service. No doubt, by the measure proposed, some private conveyance may be slightly interfered with as coachmen and private carriers were interfered with by the institution of the Post itself—as bankers were interfered with in having, here and there, one of the larger remittances which they might have been charged with sent by post, amidst the vast multitude of smaller remittances which they could never have sent at the present rates, and which would never have been sent at all but for the new and beneficent service by cheap money orders. Certain stationers petitioned and agitated against the new postage system itself, as they alleged it would interfere with their sale of envelopes and stationery. On such sordid views and ignorant cupidity, the petitioners would have deprived the community of the social and commercial advantages of a six-fold inter-communication, which apart from the new packet system has replaced the revenue. By that change of system the sale of envelopes has, however, been immensely augmented, no doubt, to the profit of the objectors. To maintain the present prohibitory rates on small parcels, for the sake of any private carriers' interest, is to retain unacceptably high charges for the separate portage, amounting to a prohibitory tax, at a vast expense of public inconvenience, for the small gain (if any) of a few private persons. Indeed, under such an extension of service as that proposed, the carriage on the trunk lines and the

railway profit on such carriage would probably be much increased. Mr. Rowland Hill's enlightened principle of saving the public the trouble of inquiring for the right charge, and the trouble of adjustment, by one uniform rate of postage, is applicable to the conveyance of small articles, in respect to which, at present—the public is, in addition to the heavy expense, subjected to the trouble of inquiring, or searching directories, for the proper place of dispatch, and also of looking out for, what is commonly not easily found,—the means and time of certain delivery.

When the destination of any small parcel is in the country or cross roads, the delivery is grievously uncertain, as well as expensive. Those who have had experience of the privilege of franking from large public departments, will have had repeated evidence of the common necessities in respect to small parcels, in the attempts to abuse the privilege for the purpose of getting them conveyed with certainty. At the present time the postal establishment is subjected to a war of evasion, for the conveyance of small parcels as books, of which instances might be given.

The charge for sending the larger parcels by the old mail-coaches was from 12s. to 14s. per cwt. per hundred miles. The average weight of a passenger is under 165 lbs. Assuming the railway charge for carrying first-class passengers were a general charge for the carriage of parcels, it would be at the rate of 1½d. per lb. per 100 miles.

Some time ago the estimated distance of the transmission of letters in England was about seventy miles each, exclusive of those sent by the district posts. An average of 100 miles for each small parcel, *inclusive* of those transmitted by the district posts and delivered within the districts, would probably be a very wide one.

It has been avowed on good authority that locomotive expenses on railways do not, on an average, exceed 9½d. per mile, and that "the cost of running a train may be assumed to be, in most cases, about 16d. per mile." But it is observed in a paper by Mr. Edward Page, Inspector General of Mails, that "these rates, while they no doubt include in some cases special elements of expense not covered by the average of 16d. per mile, are independent of the receipts obtained from passengers, parcels, and, in some cases, from goods, earnings which, added to the post-office allowance have, in many instances, rendered the mail train one of the most profitable trains on the line," instead of being, as is sometimes supposed, a sacrifice and a grievance. Indeed it appears on impartial examination, that although the speed of the transmission of letters has been augmented by railway, the cost of the conveyance appears to be augmented against the public, the present rates being, in some instances, at from 2s. to 4s. per mile, or at a profit of from 60 to 260 per cent. on the actual cost, that is to say, supposing the train carried nothing but the mail. The contrast will be seen in a Table, from the Postmaster-General's second Report.

	Mails conveyed by Railways.				Mails Conveyed by Coaches, &c.			
	Number of Miles per Week	Average Charge per Mile.	Maximum.	Minimum.	Number of Miles per Week	Average Charge per Mile.	Maximum.	Minimum.
England	21,069	9 9½	1 10	d	19,371	2½	0 10½	Exemption from Tolls.
Ireland	7,503	1 5½	4 6	d	7,293	2	0 8	Exemption from Tolls.
Scotland	3,537	9 8½	3 2	d	5,003	2½	0 6½	Exemption from Tolls.
United Kingdom	27,109	0 10	4 10	d	31,667	2½	0 10½	Exemption from Tolls.

* The corresponding number of miles in the Report for 1854, was, on error, much overstated.

It appears, by the last report of the Postmaster-General of the United States, that the average cost per mile there (where coal and fuel is much dearer than in England) paid for the postal use of the railway, is only 5½, being little more than half the payment in this country.

The working expense of railway carriage of goods in bulk is known to be about three-eighths of 1d. per ton per mile—assuming that interest on capital is already paid by passenger or other traffic—so that a halfpenny per ton per mile, for carriage in bulk and distances of more than fifty miles—pays for steam-power, carriages, locomotion, and yields a profit of twenty-five per cent. on the work.* One halfpenny per mile is charged at the "clearing house" for each additional carriage, but it is now ascertained that supposing "the steam is up," three halfpence per mile pays for the additional steam power, for the wear and tear of the carriage, for the wear and tear of the road, for each additional carriage put on, and for its additional load, whether of goods or of passengers. But, taking even the rates of charges by mail coach, and the highest rates of charge for railway conveyance at 1½d. per lb. per 100 miles—taking a single parcel, if to the 1½d. for the main carriage in bulk, with others, we add a farthing—or, if that be too little—a halfpenny for the collection of the parcel from the letter receiving-house; and a halfpenny to the letter-carrier for its delivery from the place of arrival to the place to which it is directed, we have 2½d. per lb. for the cost of the labour on the prime cost of the service required for the public. The exact sums would be matter of investigation. But, assuming the cost stated to be near the mark, the public might be served at the rate adopted, in respect to printed matter, of 1d. for every four ounces, or 4d. per lb. for the conveyance of small parcels, with remunerative charges to the postage-staff and the letter carrier, which extra payment to the officers of the post for extra work is considered to be just and necessary, and consistent with a good profit to the revenue.

It is assumed that the business of conveyance should be left quite free and open, and that, for all the larger packages, where time and convenience served, the present conveyances would no doubt continue at the cheaper rate at which they now are carried on. There is at present much parcel delivery by companies and private carriers, at rates under 1d., and even of a halfpenny per lb. By the South Western Railway Company, parcels under 7 lbs. are carried upwards of 70 miles for 6d.; under 28lbs., 39 miles for 8d. If the public right to utilise their own establishments for their own purposes were admitted to be justly questionable, the proposed rate of charge will be a high protection-duty to the fair interests of all private carriers, for they may be confident that

* The following are illustrations of some goods charges of the Great Western and North Western—

Hogheads	} From London to Birmingham.
Barrels	
Chicory root	
Lump Sugar	} 27s. 6d. per Ton.
Raisins	
Figs	
Coffee	
Tea	32s. 6d. "
	3) 81. 8
	27. 8
	12
	327
	4

2240 lbs. 1308 q. = 1½ q. per lb. for 108 miles, or 1d. per lb. for 182 miles. A farthing per 182 miles—assuming that distance to be the average or mean for all packages sent—will be one farthing per lb.; and anything over one farthing per lb. paid to Railway companies by the Government Post-office will be so much gain to the companies.

to look as a legitimate source of revenue, it is sufficient to say:—1st. That the statement is a great exaggeration, and that your calculations of such traffic are founded on erroneous data. 2nd. That by far the larger number of the existing railways, your own inclusive, were introduced since the establishment of penny postage, the time at which the Post-office began to share in the traffic which you refer. 3rd. That the railway companies have an exclusive right in the parcel traffic, and, indeed, they are the last to complain of that interference with their modes of conveyance which they themselves (so far from speaking in blame) have carried to an extent for which it would be difficult to find a precedent. Lastly, it might be shown that the distribution of parcels by the Post-office with its undivided responsibility, and its wide organisation, uniting every town with every village one with another, and thus supplying facilities which the railways do not possess, so far from being a disadvantage to the public at large can need no illustration."—"I may mention," says Mr. Hill, "with a view to this examination, I have made inquiries of the publishers who use the book extensively, and the information that I have obtained from them is to this effect, viz., that the great majority of the books sent through the post are not, but for the convenience afforded by the Post-office, sent at all; and that the minority are not abstracted as small parcels which would otherwise be conveyed by the railway companies, but are taken from the booksellers' parcels, such as are usually sent from London publishers to the country booksellers. Now, there can be no doubt that the Post-office pays the railways at a higher rate for the conveyance of the books than that which the booksellers pay for their parcels; it would follow that, even if the whole of the books sent through the post were abstracted from the booksellers' parcels, the railway companies would still be gainers; inasmuch as we not only pay a higher rate, but send a greater number of books which otherwise would not be sent at all, it is manifest that the companies gain in two ways."

His reasoning is completely sustained by further evidence, and is at all points applicable, as previously stated, to the proposed improvement of the conveyance of small parcels, and illustrative of the views of this Committee.

Efforts were made by the railway directors on the Committee of the House of Commons, to show that the conveyance of small parcels by the post impeded the ordinary letter conveyance, but these efforts failed. Mr. Hill was asked:—

Q. Have you any reason whatever to believe that the conveyance of such letters as may be called parcel letters interferes in any way with the due conveyance of ordinary letters and newspapers?—Not the slightest.

Mr. Hill further illustrates this subject:—

Q. "With respect to the conveyance and distribution of these small parcels, do you think that any organisation of railways, or otherwise, that could be established, would take the place of that organisation which already exists in the Post-office system, penetrating, as it does, every quarter of the United Kingdom, and to every remote village and town?—One can hardly conceive the possibility of another organisation equally perfect. If the railway companies were to attempt it, they would incur enormous expenses; and it appears to me to be more to their interest to avail themselves of our organisation than to attempt to establish one to compete with it. I would mention also, if you please, with reference to this question of parcels, that in several parts of the Continent the heavier packets are actually charged at a lower rate; that I know to be the case in France. The charge for a letter not weighing more than seven grammes and a half, which is about equivalent to a quarter of an ounce, will be, on the 1st of July this year (when their law changes), 20 centimes, or 2d.; but for

heavier packets they charge at the rate of 80 centimes, or 8d., for 100 grammes, which is equivalent to about three ounces and a third. Their rates, therefore, for heavy packets are less than one-third of the rate for letters, and there is no limit to the weight that may be sent at those rates.

Q. Do you recollect that Captain Huish, in his own case, gives rather a good illustration of the use of the Post-office, in collecting a great number of small parcels from very remote quarters of the kingdom to one spot?—He does.

Q. What inference do you draw from the Post-office being so used by a gentleman who is himself the manager of the largest railway system in England?—It seems to imply an admission of the very inferior organisation of the railway companies for the purpose of transmitting small packages; and it also, I think, indicates the enormous inconvenience which would be sustained by the public if any attempt were made to withdraw the privilege. It will be seen by Captain Huish's evidence, that the Post-office was employed, not only for the collection of articles on a special occasion, but that, after that occasion had passed by, certain articles continued to be transmitted through the Post-office to Captain Huish's house.

Q. Does it ever happen that a parcel cannot be prepaid by railway from any one place to some other?—I believe that, on the northern side of the Thames, it is possible to send a packet, and to pay the carriage in one sum, from any town to any other town upon the same system of railways; but it is not so on the southern side of the Thames. I took occasion to make the inquiry a few days ago. I was at Brighton, and I found that I could not have pre-paid the carriage of a parcel from Brighton to Dover; and the honourable Member on my left (Mr. MacGregor, a railway director,) will probably be able to tell the Committee whether it would be possible to pre-pay the carriage of a parcel from Dover to Brighton. I have ascertained that it is not. Here you have two lines, which are so closely connected that one may be considered as a branch of the other.

Q. You consider the distribution of small parcels by the Post-office a convenience to the public?—An enormous convenience to the public.

Q. Do you think it is disadvantageous to railway companies?—I do not believe that it is. In the first place, I believe that, if the transmission of them were to be abandoned by the Post-office, very few of those parcels would go by railway; and next, I am quite satisfied that the practice of the Post-office conveying parcels has been so prominently put forward by the railway companies as a hardship upon them, that the awards have been very seriously affected thereby; and I have not the slightest doubt that the railway companies are deriving a much higher profit through the Post-office, in respect of parcels, than they could possibly obtain if they carried the parcels themselves.

Q. Upon what ground do you say you do not think these parcels, if not conveyed by the Post-office, would not be conveyed by railway?—I believe my statement was, that the greater part of them would not be conveyed by railway, for this reason: that the railway companies have not the means of collecting and delivering them, and also because a large number of those parcels, as has been shown in evidence, are charged at very low rates. The companies charge rates so very much higher, that the imposition of those rates would, in all probability, prevent the transmission of most of the parcels. If I recollect rightly, fully three-fourths of the parcels in question are under the weight of two ounces; that is to say, they are carried at rates varying from a penny up to fourpence, and many of those enormous distances; so that any charge which a single railway company might make upon those parcels must either be exceedingly small, or it must be such that the accumulation of charges would altogether prevent their transmission.

Q. You leave out of sight then, asks an honourable member, a railway director, advocating the supposed interests of the companies, the fact that the railway was any with which you were connected, and the one with which I was connected when we met on railway matters, each obtained their Act of Parliament on premises which showed that they relied on a certain amount of credit to produce a dividend for their subscribers?

This witness estimated the loss at £50,000 per annum

for the London and North Western Railway alone, which at the same rate for all other railways of Great Britain, would make the total loss to them upwards of a million per annum, or nearly equal to the net revenue to the public of the post itself. Other railway witnesses stated as a fact, in general terms, that "great loss" occurred to their respective lines from the Post Office competition. Now, it turns out that the total amount of money received by the post for the transit of parcels was at that very time little more than £16,000 per annum for the whole kingdom—a fact in itself proving the prohibitory nature of the present rates for small parcels. The very small sum may be cited in support of the Committee's conclusion that the present rates of the post itself are, to a large extent, prohibitory, as are also railway charges, and must be. It may be here observed, that in those continental states where the post is used for the conveyance of parcels to an extent beyond anything which is here contemplated, as expedient, or as practicable, under the system of perfectly free private conveyance proposed, with much dearer coals, dearer iron and materials, with one-third lower rates of fares even for the like speeds and better accommodation to the public, the return on the capital invested averages upwards of 5 per cent. as against the general average of little more than 3 per cent. yielded to the capitalist by the existing railway management in England. In respect to the inability of the railways to deal with the delivery of the smaller parcels, and the public utility of a parcel post, the manager of the London and North Western Company gives testimony. Captain M. Huish was asked—

"Q. The evidence given by Mr. Hill is, that the up-parcels do not form anything like one-half of those which go by the down mails?—We find, taking a series of years, that our up-parcels into London are about one-half of those which go out of London. I might give a very striking illustration of this subject which fell under my own personal observation. Last year I had a bazaar in my grounds near London for a very popular object connected with Ireland; about £2,000 worth of work was sent to Mrs. Huish for this bazaar; it was very well attended, and a number of titled ladies were kind enough to assist in it. My connection with that bazaar first gave me an insight into the working of the Post-office, for although I will not say that a grand piano came by post, everything short of it for this bazaar came by post. Of these £2,000 worth of worked alippers, and all the endless things which ladies made for the bazaar, a great quantity came by post [it being perfectly free to the railways to have collected and delivered them at the same very high price]; it did not terminate there, for a very large amount of the work which came from Ireland through the post was composed of that beautiful work for which the Irish schools are so celebrated; by means of the bazaar it was brought to the acquaintance of a number ofadies in London, and the result has been that since that time Mrs. Huish has established a complete system of trade with those schools, and she gets over every day ace, and all sorts of things, by post, not any of which ever goes by the railway company." [We may add, not one of which, probably, could be carried by the railway company without separate portorage, a charge which would be prohibitory.]

"Q. With reference to the parcels which came from various parts of Ireland, and the schools which are dotted over the whole of the interior of Ireland, the west coast, and everywhere else, do you believe it is possible, by any combination of railways which exist at the present time, with steamboats, that those parcels could have reached London with the same punctuality and ease that they did by the Post-office?—They would not have reached London quite so cheaply [the charge by post being a high one], I am aware; but I should like to have tried if I could not have brought them quite as correctly."

"Q. As you are perfectly aware, those schools are dotted all over Ireland, upon private estates and in villages, and are matters of social improvement taken up by private individuals in the different localities of Ireland; do you think it possible, without an enormous expense, which would be far more than tantamount to any gain, to organise any system by which those parcels could reach London from all those innumerable points, with any degree of punctuality?—I am quite prepared to admit that the public does derive a very considerable advantage from the fact of the postal arrangements being in one hand, instead of being divided between a number of railway corporations, who have to work into each other's hands; I do not intend to bring this instance forward as a real grievance, to prevent the Post-office, pursuing the system, but only as an illustration of the sweeping way in which the Post-office competes with us for parcel traffic; I admit what Mr. Rowland Hill has said, that we have no monopoly of parcel traffic, and do not ask for a monopoly."

"Q. Is it not one of the greatest conveniences which the public have in consequence of the plan pursued by the Post-office, that the Post-office is a direct communication, not by railway only, but they use railways where railways are effective, and steamboats where steamboats are effective; and where neither of those plans suit their convenience, they are obliged to have recourse to other means to reach every village in the United Kingdom; so that there exists a direct means of communication almost as speedily as can be obtained under the circumstances of the case, with every part of the United Kingdom?—That is so, undoubtedly; I do not desire to deprive the extreme districts of that convenience, or the outlying rural parts, of the advantage which they now possess, but I think it is carried a little too far; and it would not surprise me any morning to find barrels of oysters with penny stamps upon them, carried over the kingdom as post letters."

The case of the bazaar is one on which the Society of Arts might rely as parallel to its own experience in respect to the collection and transmission of objects of art for its own exhibitions. But it is highly illustrative of the sense in which the word "cheapness" is used by the railway companies; that when it is admitted by the witness in behalf of the company that they could not have carried the parcels "quite so cheaply" as the post, the cheapness referred to was a rate of two shillings and eight pence per pound, or no less than £298 per ton.

In a letter by Mr. E. J. Page, the Inspector-General of Mails, published in the Appendix to the second report of the Postmaster-General, a further illustration is given of the principle in question. He states, as bearing upon the comparison of the railway and postal facilities for the conveyance of book parcels (which we submit as equally applicable to all small parcels)—

"As bearing strongly upon this comparison of facilities, I may mention the somewhat remarkable fact, that copies of the very report of the Committee of Consultation of the London and North-Western Railway, in which the Post-office is represented as unduly competing with railway companies for the carriage of books and parcels, were extensively circulated to that Company's shareholders through the medium of the book post, not merely to towns and villages at a distance from their railway, but even to Liverpool, to which the Companies' own trains might have carried them without any charge whatever. When it is recollected that there are about 10,500 post-offices scattered throughout the United Kingdom, that there is scarcely a village without a post-office, and scarcely even a hamlet without a regularly established official means of communication with a post-office, and that consequently persons even in the most secluded districts can communicate by post with all parts of the kingdom with tolerable certainty, and with very little trouble or expense, it will readily be seen that such facilities as these must lead to the transmission

books and documents [and small parcels of all kinds] which otherwise would never be sent."

He adds further:—

"Now, even assuming for a moment that every book parcel which the Post-office carries is abstracted from parcels which would otherwise be conveyed by railway, it is obvious that the companies would not sustain any loss by such parcels becoming part of the mail, if the Post-office paid to the companies for its mails rates only as high as the booksellers pay them for their parcels, in which, for the most part, such books would be conveyed, if they were sent at all. But it is a matter of fact, that the general rates paid by the Post-office to railway companies are largely in excess of those paid by the booksellers for their parcels. It follows, therefore, that the companies, instead of being injured, would be benefited by any such abstraction, seeing that, besides receiving a higher rate of remuneration for the carriage of these book parcels, they are entirely relieved of the cost of collection and delivery, a cost which, as Mr. Stephenson shows, renders goods traffic less profitable to railway companies than passenger traffic."

Mr. G. A. Saunders, the manager of the Great Western Company, alleges that they could carry parcels as punctually as the post, but he admits exceptions which, when examined, establish the whole case for utilising the post.

"Q. Do you think the railways could organise any plan by which parcels could be delivered as punctually and conveniently by them as they are now by the Post-office?—I think they can be delivered just as punctually and conveniently, with the single exception [i. e. eight or ten thousand] of the more remote places where we hire not *got delivering agents*; in which case the Post-office bags taken to particular places possess an advantage over us, and it is there principally that they obtain the parcel trade."

"Q. You would have more difficulty than the Post-office have, would you not, in sending parcels into remote villages?—There is no doubt of that [that is to say, in the vast majority of cases]. With regard to parcels I would make this observation, that we avail ourselves principally of the mail-carts that are running to and from our stations, and we make them the parties to carry these very parcels to and from different districts in the country; I believe that one great advantage the Post-office derive from the mode in which we carry on our business in connection with them is, that they get their mail bags carried much cheaper between the stations and the surrounding country, because these mail-carriers derive a benefit from the distribution of our parcels; for instance, at Chippenham station, whence the bags are distributed far down in the lower part of Wiltshire, the mail cart owners who carry these mail bags make a considerable profit out of the parcels that we give them for distribution."

"Q. You say that you make use of the mail-carts to a great extent for the conveyance of your own parcels?—Yes; if you send a parcel from London to Malmesbury, for instance, that parcel is charged from London to Malmesbury, and it is composed of three different portions of amount; for bringing it to Paddington, 3d. is paid for taking it from Paddington to Swindon, 3d. is charged; I am assuming those sums; and then the carrier gets 1s. 3d. or 4d. for taking it over to Malmesbury. The way in which these people are paid for it is by getting their proportion out of the whole charge made for the parcel; we have over those parcels to the mail carrier and his gain is derived from the whole portion of the charge as between the railway station and the place of destination, &c. &c."

According to the witnesses, they use the mail-carts, and thereby make a free use of rail, on those terms the trusts would be prevented from taking more than five per cent. *average* profit have been deprived of paying

traffic, and have been extensively injured by the powerful competition of the railways.

"Q. From the extensive means the Post-office have of delivery, they certainly have the preference, to some extent, as carriers of parcels, have they not?—No doubt they possess advantages over the company."

If the number of receiving-houses or delivering-houses of the largest company in the metropolis, be compared with the number of the receiving-houses and the deliveries of the Post-office, the case would be decisive for the adoption of a general public agency. But it is the remote suburbs of the metropolis, and the larger towns, the remote villages, the remote farms, and the remote gentlemen's seats—which comprise the larger bulk of the population—which are not to be reached without a new and separate agency; and in respect to them, it is demonstrable that, if the railway companies or any private carriers were to establish a new and separate and universal portage, and were to charge only the prime cost of the labour of that new portage, and nothing for any new investment, that separate charge must, to be remunerative, be prohibitory of the convenience and the traffic now contemplated.

In fact, as maintained by Mr. Rowland Hill (himself a railway shareholder, and formerly chairman of the London and Brighton Railway, one of the best administered railways in the country), it is conclusively established to be to the interest of the companies themselves that the Post-office should act as collectors and distributors of these small parcels, which the companies or private carriers cannot everywhere collect, or everywhere distribute themselves. It is clear that the post must thus largely augment the main traffic of the railways, for which they charge so highly and profit so largely upon the actual expense of conveyance.

The effect upon common carriage of the change we propose, appears to be, in some respects, exemplified by the change occasioned by the abolition of the compulsory newspaper stamp.

When the stamp was compulsory, and when it conferred the privilege of free transmission, the great bulk of the stamped papers were conveyed by post. Since the abolition of the compulsory stamp, the number of newspapers conveyed by the post has been reduced to one-third the previous amount; the cheaper modes of private carriage being now resorted to for the conveyance of the bulk; the smaller proportion, still transmitted by post, being exceptional cases, where there are no regular new-vendors cheaper deliveries, and where the postal delivery must be resorted to, from the alternative of the expense of separate portage being prohibitory. The bulk of the parcel or goods transmission would remain with the railways or with private carriers, and the bulk of the carriage along the main lines would be augmented by the amount of small parcels which will hereafter be sent at the book parcel rates, composed of the exceptional cases where the expense of separate portage is now prohibitory.

The facts confirmatory of this view are thus stated by the Inspector General of Mails, Mr. Page, in the document already cited:—

"It has been ascertained," he says, "with regard to the night mails from London, by which by far the largest proportion of books is conveyed, that the reduction in the number and actual weight of newspapers conveyed by these mails, since the alteration in the Newspaper Stamp Act, is more than six times the total number and weight of *all* the book parcels. To show the extent to which weight has thus been abstracted from the mails, I may mention that the number of carriage loads of bags sent from the General Post-office to the Eastern-dock station on Friday nights, has, since the recent Newspaper Stamp Act took effect, been five less than previously, and that the average nightly reduction of weight of newspapers despatched from London is upwards of two tons and a-half. At the same time it is

beyond doubt, that the effect of the Act in question has been largely to increase the newspaper circulation of the kingdom, and consequently to add still further to the earnings of the railway companies."

"In fact," he says, "the book post service [to which we add the small parcel service] is one so different in its character and objects from that to which the parcel arrangements of the railway companies are adapted, that it may fairly be assumed it would hardly exist at all but for the extensive facilities for its development which the Post-office possesses. The evidence given before the Select Committee on the Conveyance of Mails by Railways (1854), especially that of Mr. Charles Knight, the eminent publisher, is very decided on this point. He says (3,872), 'that the cases in which books are sent by post may be nearly all considered as exceptional cases to the ordinary commercial operations of publishing,' and again (3,870) and (3,892), 'that the book post may be looked upon as a mere auxiliary to the conveyance of parcels by other means,' and (3,860) 'that if the existing regulations were stopped, the public would not be able to derive the same advantages through any other channel.'"

The conclusion may be adopted for the general small parcel conveyance by post, from the experience, as above stated, of the book conveyance by post, that at the like rates it will be simply auxiliary to any conveyance of parcels by other means, which open competition may supply at lower rates.

In such instances as that of the Bazaar, only the lightest description of articles could have been forwarded, and many important contributions must have been excluded which could not have borne the present rates of parcel carriage. The railway companies would not, for their own book distribution, think of subjecting themselves to the charge for separate portage.

There were on the Committee of the House of Commons the chairmen of two large companies, and considerable shareholders. Nevertheless, the following resolutions appear to have been passed unanimously,—the objection to the public right and principle of a parcel-post may be assumed to have been abandoned by the chief representatives of the companies.

"From a personal inspection of the Post-office on the day alluded to by Mr. Hill," say the Committee of the House of Commons, "your Committee have reason to believe that a large proportion of these parcels were of a sort which would not be sent, but for the facilities afforded by the Post-office in their distribution.

"It is, however, undoubtedly the case" [the contrary, it may be observed, was very clearly proved], "that a considerable amount of parcels is thus abstracted from the usual means of conveyance, and that the Post-office is become, to that extent, a competitor with public carriers.

"Your Committee by no means recommend that the present practice should be abandoned; on the contrary, they believe that incalculable advantages are derived from it by the public, not only as regards convenience in the transmission of common parcels, but more particularly in the diffusion of literature and knowledge in country districts, which could not be approached with equal facility by other means."

The decision of the Committee of the House of Commons, and more particularly the evidence given before that Committee in the course of the important investigation, will be found an impartial examination in complete concurrence with the conclusions first stated in this report. The committee's decision establishes, upon the postal experience and testimony, the principle of a general small parcel post for the benefit of the public, and indeed for the real interests of the railway shareholders themselves.

What some persons call leaving the business of conveyance to the "free course of trade," is, in fact, leaving the public conveniences and necessities to multifarious irresponsible monopolies. To dispense with the services of a public and nearly universal portage—to forbid

them to be exercised in free competition, even at high charges on the working expenses, is to maintain a protectionism of the worst sort.

The returns show that whilst 13 per cent. only of the weight of the mails carried is made up of letters, and 2 per cent. of book parcels, no less than 75 per cent. of the weight formerly conveyed consisted of newspapers.

From the calculations of the deficit of revenue, but, above all, from the cheaper rate at which it will be practicable to convey large parcels, in which the newspapers may be conveyed along the main lines at less than fourpence per lb., the reduced rate at which printed matter is carried, it appears to be highly probable that a void will have been occasioned in the public mail bags for some time at least, by the proposed alterations of the law in respect to newspaper stamps. This void the improvement and extension of the small parcel postage would no doubt eventually fill up. We say eventually, because we believe that the increased effects of the improvement, important as they are, will be gradual.

In fixing the rate of postage for printed matter at fourpence per lb., it is to be presumed, and it is indeed clear, that the interests of the revenue have been fairly consulted. If no such rate had already been officially fixed, we should have proposed, that the charges for the establishment being already more than paid for, the amount of the extra service in collection and distribution, as well in main carriage required to be performed, should be carefully and impartially analysed, and its prime cost determined, and a fair profit allowed to the post and to the postal establishment, and also extra remuneration to the collectors and distributors.

By the opponents to the public parcel postage, it was alleged that it must impede the transit of letters. This allegation was decidedly negated by Mr. Rowland Hill, who showed that a very trivial effect would be produced on the transit of letters if the parcel postage were taken away;—therefore, very little effect upon the dispatch of letters can be fairly anticipated from the gradual additions consequent on the proposed improvement of the parcel postage. The Committee apprehend that, with the additional emolument derivable from an improved and cheapened parcel postage, deliveries by the use of carriages or horses may be eventually extended, and the general transit be improved to an extent proportioned to the extension of business, as with all great private establishments.

The proposed parcel postage may be made the means of improving and completing the postal deliveries in rural and thinly-populated districts, where the deliveries are now very imperfect.

In France, the postal delivery is established direct to every house. In England, the delivery to every house is not complete, although, under the existing administration, it is rapidly tending to completion. It is to be hoped that the measure proposed may aid the more complete accomplishment of that important object.

The Committee of the Society, with their Chairman, Lord Ebrington, have availed themselves of a permission to see the central establishment at St. Martin's-le-Grand in operation.

One night's inspection of the ordinary business sufficed to convince the Committee that the present edifice is inadequate to the accommodation of the present postal service of the country. That edifice was designed for the old system of postage, in which artificial light was required, to examine letters, for their taxation for enclosures chargeable with double postage; it is dark, and heated to excess with the gas-lights required for the transaction of the present business; it is badly ventilated, and overcrowded, and must be injurious to the health of those who work in it, and who deserve every fair personal accommodation they can receive in the performance of their duty from the public. Since it was constructed, the business has increased more than sixfold beyond the amount for which it was designed. It

understood that measures are being taken to remedy, as far as may be practicable, the want of ventilation, but the present building cannot be expected to be made suitable to the transaction, with proper comfort to the officers, of a five-fold mass of business.

If the postage business of the country were conducted, at the existing or the proposed rates of charges, as a commercial business, by a commercial firm, there would be no hesitation in immediately acting upon a determination to obtain new and more appropriate premises. The profits arising from the extension of the business, at the proposed rates, would be looked to as a means of obtaining more extended structural arrangements, and for putting the agency on a better footing, systematising completely the whole service.

The Committee confidently urge the adoption of the proposed measure, as one which will conduce to the improvement of the whole of our present postal system, and of the condition of the subordinate agents, and means of general distribution.

Whilst the Committee feel an entire confidence in the main principle of the measure they recommend—corroborated as it is by the powerful evidence recited—they would, as to the executive details, defer most respectfully and confidently to the ability and zeal prevailing in the postal department, by which one of the most important and brilliant administrative reforms of our time has been accomplished, not only for this country, but, by the influence of its example, for the civilised world.

The chief conclusions arrived at upon an examination of the subject are—

First, that the unavoidable labour, and consequent expense and uncertainty of the transmission of very small parcels, particularly over cross-country or through different lines of conveyance, whether by private means or by the public, is at present, in a large proportion of cases, prohibitory.

That the postal establishment, having an agency for the collection and distribution of letters, (or what may be termed an universal portorage, available for the collection and delivery of small parcels), may, without any materially increased establishment charges, and with compensation to the establishment and profit to the revenue, render to the public the increased service of the conveyance of small parcels, at an expense not exceeding that of the book postage, or at a cheaper rate, as respects such small parcels, than could possibly be accomplished by any separate agency for the purpose.

That it may render this service, as has been already done as respects the conveyance of books, without any serious detriment to legitimate private conveyance or railway service—but with increased profit to such private service by increased conveyance in bulk—arising from the increased transmission of small parcels, consequent on the increased convenience for their collection and distribution.

That the proposed extension of the postal service to the transmission of small parcels will be of great convenience and benefit to the arts, to practical science, to industrial occupations, and to family and trading inter-communication.

The Committee therefore propose to submit to Her Majesty's Government, that it will, for the special interest of the arts, and of trade, as well as for the general convenience of the public, as also in the interests of the revenue itself, and with extra pay for extra work, to the public servants performing it—exercise the authority with which it is charged, to remove the limitation of the proposed rates of fourpence per lb. to printed matter, and extend the conveniences of the postal delivery to all other matters, subject to the like limitations for postal convenience to which the book parcel postage is now subjected.

The Committee trust that a due consideration of the facts of the case, and the principles involved in the measure will have the concurrent support of the im-

partial members of the Chambers of Commerce and of the Institutions in Union throughout the country, to whose especial attention they commend it.

EBRINGTON, *Chairman*.
E. CHADWICK, C.B.
H. COLE, C.B.
PETER GRAHAM.
J. J. MECHE.
SAMUEL MORLEY.
J. A. NICHOLAY.
J. INGRAM TRAVERS.

A copy of the foregoing report has been sent to every Institution in Union with the Society, accompanied by the following letter:—

Society for the Encouragement of Arts, Manufactures,
and Commerce, Adelphi, London, W.C.,
8th July, 1858.

SIR,—I am directed by the Council to forward you a Report, which has been presented to the Council by a Committee, on the subject of a Small Parcels Post.

This subject was, some time ago, suggested to the Council as deserving of careful consideration, and the Council appointed a Committee to report upon it.

This Report, a copy of which I send by this post, shows that the subject is of very great and general importance, and that it is only necessary to allow parcels to be conveyed at the same rate as printed matter to effect the object.

To enable the Council to take measures, by the Society of Arts, to advance this reform, it would be a great advantage if the collective opinions of the members or of the governing body of your Institution, upon the points raised in the Report, and upon the subject generally, could be produced to assist the judgment of the Council.

I am, therefore, to request that you will cause the necessary steps to be taken, by holding a general meeting of your members or otherwise, for obtaining an expression of the views of your members or managing body in reference to it, and that you will be so kind as to communicate the result to me as early as convenient.

I am, Sir,

Your obedient servant,
P. LE NEVE FOSTER, *Secretary*.

EXAMINATIONS, 1858.

Since the publication of the list of certificated candidates, the Council have received from the Local Board at Manchester proper forms of declaration, duly filled up and signed, referring to the papers worked in Arithmetic, Bookkeeping, Trigonometry, and French, by the candidates there. The Council have, therefore, been able to award to them Certificates as follows:—

Candidates' Numbers.

- 401—John Caw, aged 17, Manchester Athenæum, clerk—A Certificate of Excellence in Arithmetic.
- 404—Thomas Baker, aged 20, Oldham Lyceum, mechanic—A Certificate of Competency in French.
- 405—Thomas Crellin, aged 21, Oldham Lyceum, mechanic—Certificates of Proficiency in Arithmetic, and of Competency in Trigonometry.
- 406—Ralph Crompton, aged 23, Oldham Lyceum, weaver—Certificates of Excellence in Bookkeeping, and of Competency in Arithmetic.
- 410—Charles Henry Berrisford, aged 18, Stockport Mechanics' Institution, mechanic—A Certificate of Competency in French.
- 412—George William Davies, aged 19, Stockport Mechanics' Institution, moulder—A Certificate of Proficiency in Arithmetic.
- 413—Joseph Epton Hadwick, aged 20, Stockport Me-

...tion, mechanic—A Certificate of.
... Arithmetic.
...ingham, aged 19, Miles Platting
...stitution, warehouse boy—A Cer-
...they in Book-keeping.

...has been addressed to the Secre-
...Lyceum, with reference to an ir-
...out the papers in Geometry and
...mented the declaration required by
...gence to the working of the papers,
...its integrity by the Local Board:—

...Encouragement of Arts, Manufactures,
...and Commerce, 8th July, 1858.
...ted by the Council of the Society of
...to you the decision which they have
...reference to the Oldham Candidates.
...with the regulations laid down for
...Local Boards cannot be passed over,
...ates are therefore disqualified from ob-
...and Prizes. The Council much
...Candidates, from no default of their
...thus disqualified; but in order that
...all parts of the country may feel secure
...tion will be perfectly fair, the essential
...regulate it must be well known and
...They were fully communicated to the
...the Institutional Association of Man-
...Council of the Society of Arts must sup-
...and maintain the disqualifications of
...You will probably be able to make
...ments for conducting your Examinations
...year. The Council desire me to request
...No. 405, Thomas Crellin, the enclosed
...to No. 406, Ralph Crompton, the en-
...as a present from this Society in token
...with the Candidates in the disappoint-
...ny must necessarily feel.

...the amounts which it appears from the
...Examiners these Candidates would have
...izes if they had not been formally disquali-
...ving them.

I am, Sir,

Your obedient servant,

P. LE NEVE FOSTER, Secretary.

ary, Lyceum, Oldham.

INSTITUTION OF CIVIL ENGINEERS.

Council of the Institution of Civil Engineers have
...ted the following Premiums for papers read at
...ings during the past session:—

Telford Medal, to James Atkinson Longridge,
...C.E., and a Council Premium of Books, to
...Henry Brooks, for their Paper "On Submerging
...bic Cables."

Telford Medal, to George Robertson, Assoc. Inst.
...his "Investigation into the Theory and Practice
...Mortar."

Telford Medal, to James Henderson, Assoc. Inst.
...his Paper "On the Methods generally employed
...wall, in dressing Tin and Copper Ores."

Telford Medal, to Robert Jacomb Hood, M. Inst.
...his Paper "On the Arrangement and Construc-
...Railway Stations."

Telford Medal, to Major-General George Borlase
...here, Assoc. Inst. C.E., for his Paper "On
...Works in the Bengal Presidency."

Telford Medal, to Alfred Giles, M. Inst. C.E.,
...Paper "On the Construction of the Southampton
..."

Telford Medal, and the Manby Premium to Guil-
...Molesworth, Assoc. Inst. C.E., for his
...the Conversion of Wood by Machinery."

Telford Medal, to Thomas Spencer Sawyer, for his

Paper "On the Principal Self-acting and other Tools
employed in the Manufacture of Engines, Steam Boilers,
etc."

9. A Council Premium of Books, suitably bound and
inscribed, to Frederick Charles Webb, Assoc. Inst. C.E.,
for his paper, "On the Practical Operations connected with
Paying-out and Repairing Submarine Telegraph Cables."

10. A Council Premium of Books, suitably bound and
inscribed, to Henry Conybeare, M. Inst. C.E., for his
"Description of Works recently executed for the Water
Supply of Bombay, in the East Indies."

11. A Council Premium of Books, suitably bound and
inscribed, to Samuel Alfred Varley, for his Paper "On
the Qualifications requisite in a Submarine Cable, for
most efficiently transmitting Messages between distant
Stations."

12. A Council Premium of Books, suitably bound and
inscribed, to Richard Carden Despard, for his "Descrip-
tion of Improvements on the Second Division of the
River Lee, with Remarks on the Position of Canals
generally."

13. A Council Premium of Books, suitably bound and
inscribed, to Alexander Wright, Assoc. Inst. C.E., for
his Paper "On Lighting Mines by Gas."

14. A Council Premium of Books, suitably bound and
inscribed, to James Brunlees, M. Inst. C.E., for his
"Description of the Iron Viaducts erected across the
Estuaries Leven and Kent in Morecambe Bay, for the
Ulverstone and Lancaster Railway."

It may be mentioned that two of these awards, the
Watt Medal and the Manby Premium, are now presented
for the first time. The former originated with the
Council, who were desirous of possessing some distinctive
means of rewarding excellence in communications upon
mechanical subjects. The medal has been executed by
Mr. Joseph S. Wyon. On the obverse is a beautifully-
executed medallion likeness of James Watt, and on the
reverse a representation of the steam-engine, as con-
structed by him. The Manby Premium is due, to the
liberality of Mr. Charles Manby, F.R.S., who has filled
the office of secretary for the last nineteen years, and
with so much satisfaction to the members, that a few
months back they presented him with a clock and can-
delabra, and a cheque for £2,000. In acknowledging
this handsome testimony of his services, Mr. Manby re-
quested that the Council would receive debenture stock
of the value of £200, bearing 5 per cent. interest, to be
expended in an annual premium. In accepting this offer
it was resolved that the premium in question should bear
the title of the "Manby Premium."

SOUTH KENSINGTON MUSEUM.

During the week ending 3rd July, 1858, the visitors
have been as follows:—On Monday, Tuesday, and
Saturday (free days), 4,128; on Monday and Tuesday
(free evenings), 3,861. On the three Students' days
(admission to the public 6d.), 1,111; one Students' even-
ing, Wednesday, 174. Total, 9,274.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Part. No.

Delivered on 1st July, 1858.

348. East India—Home Accounts.

349. Dead Letter Office—Returns.

350. Spirits—Returns.

372. East India Company (sums repaid)—Returns.

323. Cambridge University—Copies of Statutes.

165. Bills—Civil Bills, &c., (Ireland) Act Amendment.

166. ——— Corrupt Practice Prevention Act Continuance.

167. ——— Navigation Advances (Ireland).

Delivered on 2nd July, 1858.

353. Tobacco—Returns.

357. Greenwich Hospital—Returns.

367. Paper—Returns.

363. Arterial Drainage (Ireland)—Returns.

369. War Department (Purchase of Houses)—Correspondence.

Delivered on 3rd and 5th July, 1858.

- 371. Education (Mauritius)—Return.
- 365. Wheat, &c.—Returns.
- 373. Expiring Laws—Report from Committee.
- 374. Irremovable Poor—Report from Committee.
- 377. Emigration—Return.
- 378. Imports and Exports (British Colonies)—Return.
- 168. Bills—Universities (Scotland) as amended in Committee and on Re-commitment).
- 171. ——— Judgments (Ireland) Act Amendment.
- 174. ——— Four Courts (Dublin) Extension (as amended by the Select Committee).
- 170. ——— Government of New Caledonia.
- 172. ——— Admiralty Court.
- 173. ——— Superannuation Law Amendment.
- 175. ——— Detached Parts of Counties.
- 176. ——— Police (Scotland) Act Amendment.
- 177. ——— Lunatics (Scotland) Act Amendment.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, July 2, 1858.]

Dated 6th March, 1858.

- 460. P. A. Cap, Paris—An improved construction of billiard table for drawing-rooms.

Dated 19th May, 1858.

- 1112. H. Walker, Gresham-street—Imp. in the manufacture of needles.

Dated 29th May, 1858.

- 1214. T. V. Lee, Thames-chambers, York-buildings, Adelphi—Imp. in the construction of steam generators applicable to marine locomotive and all other uses where steam is applied as the motive power.
- 1216. D. Hebeon, Liverpool—Imp. in ships' gear, part of which is applicable to forming ropes for general purposes.

Dated 3rd June, 1858.

- 1242. T. Scholesfield, Paris—Imp. in gas meters.

Dated 8th June, 1858.

- 1286. B. Wappenstein, Manchester—Imp. in the manufacture of artificial whalebone, applicable to umbrellas, parasols, stays, hats, bonnets, reeds, crinolines, and other similar purposes.
- 1288. J. C. Quince, Crosby-hall Chambers, Bishopsgate—Imp. in stoppers for bottles and jars.
- 1292. J. Bunnett, Deptford—Imp. in the construction of floors, roofs, and arches.
- 1294. J. Rawlings, Collingbourn Ducis, Wiltshire—Imp. in thrashing machines.

Dated 9th June, 1858.

- 1296. G. Suarez, 1, Cullum-street, Fenchurch-street—An imp. in fire-arms. (A com.)
- 1298. D. Moseley, Chapel Field Works, Ardwick—Imp. in machinery used in the manufacture of vulcanized india-rubber thread.
- 1300. E. T. Hughes, 123, Chancery-lane—Imp. in machinery or apparatus for sowing grain. (A com.)
- 1302. W. A. Gilbee, 4, South-street, Finsbury—Imp. in the construction of railway wheels. (A com.)
- 1304. J. Easterbrook, Sheffield—An imp. in ratchet braces.
- 1306. T. W. G. Treuby, 1, Westbourne-terrace Villas, Upper Westbourne-terrace, Paddington—Imp. in revolving fire arms and cannons and cartridges.
- 1308. T. Robinson and H. Ogden, Manchester—Imp. in safety lamps, and in apparatus connected therewith.
- 1310. C. Cammell, Uxbridge Steel Works, Sheffield—Imp. in railway buffers.

Dated 10th June, 1858.

- 1312. G. Castle, 10, Tynworth-road, Croydon—Ventilating women's stays by means of perforation.
- 1314. J. Luis, 15, Welbeck-street, Cavendish-square—An alchemic value examiner. (A com.)
- 1316. J. Luis, 15, Welbeck-street, Cavendish-square—An improved balance-beam thrashing machine. (A com.)
- 1318. T. Chatwin and C. Taylor, Birmingham—Imp. in screw stocks.
- 1322. H. Reynolds, King William street—An improved method of separating glycerine from saline and other substances.
- 1324. W. C. Wilkins, Long Acre—Imp. in lighthouses.

Dated 11th June, 1858.

- 1328. G. Bartholomew, Linlithgow, N.B.—Imp. in that description of gas meters commonly called wet meters.
- 1330. S. Cheavin, Spalding—An improved preparation or combination of mineral substances, applicable for use as a pigment, cement, or mastic, or to be used either alone or in combination with other well known materials for washing, scouring, cleansing, or bleaching purposes.
- 1332. G. W. Hart, 5, Osborn-terrace, Southsea—Imp. in the manufacture of locks.

Dated 12th June, 1858.

- 1334. G. T. Stiebel, Manchester—Imp. in the means for generating steam and economising fuel.
- 1336. W. Clark, 53, Chancery-lane—Imp. in machinery for combing cotton and other fibrous material. (A com.)

Dated 14th June, 1858.

- 1340. W. Clark, 53, Chancery-lane—Imp. in curtain poles or rods. (A com.)
- 1342. H. J. Daniell, Doxington-park, Derbyshire—A process by which the stamp on bankers' cheques is cancelled, and the cheque indelibly and simultaneously crossed.

- 1344. G. Neall, Northampton—Imp. in gas stoves for warming, cooking, and other purposes; as also in the saucepans, kettles, or other utensils to be used with the same.
- 1346. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in machinery or apparatus for breaking or crushing stones for road metal, and other purposes, and for crushing ores and other hard and brittle substances. (A com.)

Dated 17th June, 1858.

- 1350. J. H. Marsden, Manchester—Certain imp. in the manufacture of hats.
- 1371. J. Haslam, Preston—Imp. in looms for weaving, and also in shuttles and pickers connected therewith.
- 1373. A. Dawson, 14, Barnes-place, Mile End-road—Improved apparatus for converting small coals or coal dust, or small coke, or coal dust and coke, with the admixture of water or other materials into artificial fuel.
- 1375. S. Taylor and D. Taylor, Rochdale—Imp. in machinery or apparatus for putting machine straps or belts on to pulleys or drums, and for removing the same.

Dated 18th June, 1858.

- 1379. E. S. Newall, Gasohhead—Imp. in the manufacture of cork ropes, and cables.

Dated 19th June, 1858.

- 1381. P. B. E. Martin, Paris—Imp. in obtaining electro-motive power.
- 1383. S. Hewitt, Manchester—An improved application of printed designs to cotton and other fabrics, and for imp. in the treatment during the processes of printing and finishing such fabrics.

- 1385. J. Bradshaw, Bolton-le-Moors—Certain imp. in apparatus for obtaining and producing motive power.

- 1387. R. Winans and T. Winans, Baltimore, U.S.—A new and improved steam vessel.

- 1389. R. Winans and T. Winans, Baltimore, U.S.—A new and useful imp. in the mode of combining the engines and propeller shafts of steam vessels.

- 1391. H. Becu, Merville, France—Imp. in the manufacture of laths, and in fixing and nailing the same.

Dated 21st June, 1858.

- 1393. H. H. Henson, 38, Parliament-street—Preserving or water-proofing ropes, strands, cordage, cables, and other similar articles.

- 1395. R. A. Brooman, 166, Fleet street—Imp. in treating wood to preserve and colour it, and in apparatuses to be employed therein. (A com.)

- 1397. J. Crossley, St. Helens, Lancashire—Imp. in machinery for grinding, smoothing, and polishing glass.

- 1399. W. Thrift and A. High, Bedford street, Commercial-road E.C.—Imp. in house water closets.

- 1401. A. V. Newton, 66, Chancery-lane—An imp. in the manufacture of spoons and forks. (A com.)

- 1403. G. R. Scriver, Philadelphia, U.S.—An improved apparatus for ventilating, and for circulating, moving, or otherwise acting upon air or other fluids.

Dated 22nd June, 1858.

- 1405. M. Mayall and G. Jackson, Mossley, Lancashire—Imp. in machinery or apparatus for spinning cotton and other fibrous substances.

- 1407. W. Galloway and J. Galloway, Manchester—Imp. in machinery for cutting, bruising, chipping, and rasping, and otherwise treating or preparing dye woods and roots, or other vegetable substances.

- 1409. J. A. Rainé, 16, Wells-street, Gray's-inn-road—Imp. in collapsible framework for bedsteads, sofas, and other articles of furniture.

- 1411. P. Brown and B. Young, Spa-road, Barmansley—Imp. in the manufacture of white lead.

- 1413. J. Robertson, Glasgow—Imp. in apparatus for regulating the flow or passage of fluids. (A com.)

Dated 23rd June, 1858.

- 1415. T. Spencer, 192, Euston-road, Euston-square—Imp. in the treatment of iron ores and ferruginous sands, and certain applications arising therefrom.

- 1417. P. J. Livsey, Manchester, and F. L. Stott, Rochdale—Imp. applicable to machinery for warping yarns or threads.

- 1419. R. Armstrong, North Woolwich—Imp. in steam-boilers or furnaces. (Partly a com.)

- 1421. R. Rumney, J. Mellor, and W. S. Macdonald, Manchester—Imp. in dyeing and printing cotton, wool, silk, and other materials and fabrics.

WEEKLY LIST OF PATENTS SEALED.

July 2nd.

- | | |
|---------------------------------|--------------------------------|
| 17. J. Platt. | 26. F. P. Cappon. |
| 53. J. B. A. Couder. | 27. J. Bally, junr. |
| 86. V. De Tirolli. | 29. B. and J. Philip. |
| 106. W. White. | 34. P. Soames and J. C. Brown. |
| 140. W. E. Newton. | 36. E. A. Brooman. |
| 144. J. Hartman and E. Hartman. | 36. H. Atkins. |
| 618. C. N. Kottala. | 151. C. N. Kottala. |
| 986. J. G. Appold. | 293. H. Wilde. |

July 6th.

- | | |
|-----------------------|----------------------|
| 22. J. D. Malcolm. | 617. C. N. Kottala. |
| 23. M. L. J. Lavater. | 619. C. N. Kottala. |
| | 999. W. S. Hollands. |
| | 1013. W. E. Newton. |

PATENTS ON WHICH THE STAMP DUTY OF 26d HAS BEEN PAID.

June 29th.

- 1402. R. Tidmarsh.

July 3rd.

- 1409. R. Mackay.
- 1420. J. Beckett and W. Smith.

Journal of the Society of Arts.

FRIDAY, JULY 16, 1858.

MEETING OF COUNCIL.

Following Institution has been taken into the last announcement :—
Institute of Popular Arts, Science, and Literature.

SPECIAL PRIZE.

Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the French and J. MacGregor, Esq.,) and the City's Silver Medal, offered for a Writing Paper for the use of soldiers, sailors, emigrants, will be awarded according to the following conditions :—

Weight.—None will be received weighing more than five ounces when empty.

Size.—The size in length and breadth must not exceed that necessary to hold notes of paper.

Case.—The case must not contain ink in a solid state.

Material.—It must be made of a substance not liable to be spoiled by wet, and which will protect the contents from injury.

Price.—The retail price, with guaranteed supply, must not exceed 1s. 6d.

Notice.—Competitors are desired to take notice that the prize should serve to themselves the right of withdrawing the prize should there be no article of merit brought under their notice.

Articles sent in for competition must be at the Society's House, Adelphi, London or before the 1st of January, 1859.

OF WESTERN AUSTRALIA.

of Olive Oil and of Raisins have been sent to the Society from the Chamber of Commerce, Fremantle, Western Australia, which will be the produce of that colony. They have been favoured with the following certificates of their quality and commercial value from gentlemen to whom they were referred on :—

May 27, 1858.

The sample of raisins submitted to me for examination was in a bad condition, much candied, and would not keep more than a few weeks longer; its present value is not more than 5s. 6d. per cwt., duty paid (10s. being the duty). In its present condition I consider it fine fruit; but, in my opinion, the public would be better served to like it for cooking purposes. It is, however, well with, or instead of, what we call the fruit that is used for our table. It

is not good enough for that, its skin is too thick, and the flavour is not delicate enough for that purpose.

But to render it fit for cooking, the raisin should be differently cured. The Valencia raisin, which we now mainly use, is, before drying, dipped into a hot wash, which acts chemically on the skin, and literally cuts it, so that the fruit boils quickly out, and gives a richness to the pudding which cannot be obtained from merely sun-dried fruits. Thus, although many different kinds of raisins are imported into England, the Valencia produce has always, and often under the most adverse circumstances as to price and quality, maintained its preference. The wash used in Valencia consists of water which has been passed through a barrel filled with wood ashes, mixed with a very small quantity of lime; this is raised to boiling point, and the fruit rapidly dipped through it. Too strong a wash, or the fruit being at all left in it, will utterly destroy the grape; but a little practice will soon show this. The lime also must be used very sparingly, a quart being enough for a large barrel full of the wood ashes. Some sorts of wood, such as the fig, are objectionable.

And as to the probable price this Australian fruit, dressed in this way, and put into convenient packages, would bring, I should say that nothing above 45s. must be expected; from this, if you deduct duty, 10s.; landing charges, &c., 1s.; commission expenses, 1s.; freight, &c., 3s.; about 30s. would be left. It must be remembered that our great season of demand is from September to Christmas, and that all fruit arriving after that time is at a disadvantage. On the other hand, the blight has damaged the quality and reputation of Valencia, so that this Australian fruit, which appears quite free from taint, would, with many, have a preference. Its dark colour is a bad point,—probably this would be softened by the mode of dressing I recommend. I will only add that great care should be taken in packing and preparing the first quantity that may be sent to this market, so that the first impression may be good. For so long a voyage barrels would be better than boxes, but they should not be too large, certainly never beyond 3 cwt., and better if they did not much exceed 1 cwt.

Yours faithfully,
J. I. TRAVERS.

To the Secretary of the Society of Arts.

William-street, Blackfriars, May 28, 1858.

SIR,—We have carefully examined the sample of oil from Western Australia, and are of opinion that it is, as represented, a pure olive oil; specific gravity 917·8, and the reactions of chemical tests correspond thereto. It appears to us not to have been very well prepared, but we have no doubt that with improved means a better result would be obtained. We consider its present value to be about £48 per ton, delivered in London, and that it would be likely to meet a tolerably ready sale.

We are, sir, yours faithfully,
CHARLES PRICE & CO.

P. Le Neve Foster, Esq.

152, Piccadilly, June 3, 1858.

DEAR SIR,—In compliance with your request for our opinion of samples of olive oil and raisins, the produce of Western Australia, the results of comparison enable us to report very favourably on the quality of the former, which, we consider, for domestic uses fully equal to the importations from Leghorn, but bearing a closer resemblance to the oil from the South of France, which by many is even considered preferable. Such oil is now realising from 5s. 6d. to 6s. 6d. the gallon in this market, and reaches here in pipes of 108 gallons, also in hogsheads and jars; but the greatest care must be taken that whatever package is used must be perfectly free from any taste or smell likely to interfere with the delicate flavour of the oil.

Respecting the raisins, we much fear they would not be likely to prove a safe article for this market, wh

is well supplied from Spain; and we think the long voyage they would be subject to would greatly tend to deteriorate the quality, as all fruit is liable to fermentation by long stowage. The sample sent appears to us of various qualities, partaking of different characters, some evidently being of the Valencia, others of the Muscatel kind. Such fruit would not realise more than 28s. to 36s. in this country; but as a much more satisfactory clue as to results of novelties introduced in our markets, we recommend that small consignments should be sent in the first instance, the realisation of which through the hands of a respectable broker would furnish the merchant or grower with the actual value which they would realise in open market; the proceeds would show how far the article may be worth the exportation.

We are, dear sir, yours respectfully.

FORTNUM, MASON, & Co.

F. Le Neve Foster, Esq., Secretary of the Society of Arts.

EXAMINATIONS, 1858.

The following are the Papers set in the various subjects at the Society's Final Examinations, held in May last:—

ARITHMETIC.

THREE HOURS ALLOWED.

N.B.—The questions in this paper are arranged, as far as possible, in the order of difficulty, and it is not expected that any Candidate should solve more than one-half of them. The last eight questions are specially intended to test the knowledge of such persons as are desirous of gaining the highest class of Certificate.

1. Find the value of 581½ yards of cloth at 5s. 9d. per yard.
2. If 12 apples are worth 21 pears and 3 pears cost ½d., what is the price of 70 apples?
3. If an army of 5,000 men could march 96 miles in 6 days of 8 hours each; in how many days of 5 hours each could an army of 1,500 men march the same distance?
4. If the 6d. loaf weigh 35 oz. when wheat is 37s. a load; what should the 7d. loaf weigh when wheat is 29s. per load?
5. If a tradesman use a false weight of 14½ oz. for a pound; how many pounds will 112 lbs. of just weight appear to be when weighed by his false weight?
6. Calculate the cost of 365 articles at 18s. 2½d. each article.
7. Find the value of 53 yds. 2 qrs. 3 nails at 5s. 10½d. per yard.
8. Distinguish between simple and compound interest. Find the difference between the simple and compound interest of £1,000 for 3 years at 5 per cent. per annum; also find how long £1,000 would be in amounting to £1,215 10s. 1½d. at the same rate, at compound interest.
9. Bought tea at 4s. 8d. per lb. How must I sell it to gain 12½ per cent.
10. A bankrupt owes his creditors £2,960 and can pay them 12s. 6d. per £1. How much would a person receive to whom he owes £641 18s. 4d.?
11. Show that 52 weekly payments (made at the end of each week) of £1 5s. each are equivalent to a single payment of 266 5s. 6d. at the end of the 52 weeks; interest at 4 per cent. per annum.
12. Explain the difference between banker's discount and true discount. Find both the banker's discount and the true discount on a bill of £250 for four months drawn on the 4th May and discounted 27th July. (The 8 days of grace are to be reckoned.)
13. What is the smallest number that contains an exact number of sevens, dozens, and scores?
14. Whether is the sum of ½, ⅓, and ¼, greater or less than ⅔ of the sum of ½, ⅓, ¼, and ⅕; and what is the difference?

15. Prove the rule for reducing a compound fraction to a simple one.

Example.—A cask of wine containing 162 gallons is divided among 7 persons, A, B, C, D, E, F, G, in the following manner: A has ⅓ of the whole, B ⅓ of what is left, C ⅓ of the remainder, D ⅓ of what C leaves, and the other three share the remainder equally among them. Find the number of gallons claimed by each person.

16. Explain the reason of the rule for the division of vulgar fractions, and divide the continual product of ⅓, ⅓, and ⅓, by that of ⅓, ⅓, and ⅓.

17. If 15½ grains of silver be worth 2½d., what is the worth of ¾ dw.?

18. Add together the following decimals .025, .45, 8.01875, 4.0005. Reduce each of them to a vulgar fraction and add them together, and show that the two results coincide.

19. Divide .0635 by .0048, and multiply the result by 1.62.

20. Explain the term "recurring decimal," and give any method or rule you know for reducing such a decimal to the form of a vulgar fraction. Also find the values of .675 of £1, and of .07589285714 of 1 cwt.

21. Express in the decimal notation £15 12s. 6d. 16s. 4½d.; 7½d.; correctly to three places of decimals and in common notation the following decimals of £1 .89875, .109875, .6802083.

22. Supposing a currency to be established of which the coinage consists of the pound or sovereign as the unit, the florin or ⅒th of £1., the cent or ⅒th of £1, the mil or ⅒th of £1. State the advantages of such a currency.

23. A cistern has 4 pipes; A will fill it in 24 minutes and B in 40 minutes, C will empty it in 48 minutes and D in 1 hour. They all run together, but B is closed after 16 minutes and D after 20 minutes; what time is required to fill the cistern?

24. If ¼ of an ounce of tea be worth ⅓ of a lb. of sugar and ⅓ of a cwt. of sugar worth ⅓ of a gallon of rum, and ⅓ of a quart of rum worth 1s. 3½d. less than a pound of tea; what is the worth of 6½ lbs. of sugar?

25. Bought sugar at 10d. per lb. How must I sell it per lb. so as to gain as much on £100 as 4½ cwt. are sold for?

26. Suppose that in a town containing 10,560 inhabitants, 1 out of 33 dies annually and that there are 4 births for 4 deaths, the number of girls born being 7 that of boys as 7 : 9. How many boys and girls are born there annually?

27. Bought 63 dozen of sherry for £78 10s., and having retained a certain quantity for private use, I sold the remainder at £1 9s. 6d. per dozen, and thereby cleared £4 16s. 9d. over the reserve. What quantity did I retain?

BOOK-KEEPING BY DOUBLE ENTRY.

THREE HOURS ALLOWED.

1. State in general terms what are the objects sought to be attained by mercantile book-keeping.
2. What is the distinguishing feature or principle of the double entry method, as compared with that of single entry?
3. Does the double entry method necessarily prove or detect every description of error or mistake in book-keeping?
Note.—The answer to this question is to be accompanied by reason for it.
4. What are the principal books usually adopted in keeping accounts on the system of double entry?
5. What is the special use of the Journal?
6. What is the special use of the Ledger, and how is it formed?
7. What is a *Real* account intended to exhibit?
8. What is a *Personal* account intended to exhibit?

On which side of a Real account should the entry of
 1. *When cash is paid or goods (property) are delivered*
 2. *by person, what account is to be debited and what*
 3. *is or accounts credited?*

Write out the Journal entries in proper technical
 of the following transactions:—

1. *Charged of Dombey and Son 50 Pipes of*
 2. *Wine for* £1,000
 3. *of John Carker 10 Pipes of Wine for* 300
 4. *in Cash to Dombey and Son* 350
 5. *to Dombey and Son a Cargo of Staves for* 600
 6. *Post to appropriate Ledger accounts the same*
 7. *amounts.*

What is a Profit and Loss account intended to ex-
 and on which side thereof are gains and losses
 1. *properly entered?*

What is the distinction between Gross Profit and
 2. *Net?*

What is a Trial Balance? and what purpose is it
 3. *intended to serve.*

What should a Balance-sheet exhibit?

Work out the following supposititious facts and
 1. *transactions by double entry through the Journal and*
 2. *the Ledger, and draw out—firstly, a Trial Balance;*
 3. *secondly, a Balance-sheet accompanied by a Profit*
 4. *and Loss Account.*

On the 1st of January, 1853, Andrew Freeport began
 1. *his business with a capital of £2,000, consisting of—*

1. *Cash* £1,000

2. *Accounts receivable—*

3. *due 30th of March* £200

4. *„ 28th of January* 100

5. *Wine* 300

6. *„* 700

7. *Total* £2,000

8. *„* £

9. *„* 0

10. *„* 0

11. *„* 0

12. *„* 0

13. *„* 0

14. *„* 0

15. *„* 0

16. *„* 0

17. *„* 0

18. *„* 0

19. *„* 0

20. *„* 0

21. *„* 0

22. *„* 0

23. *„* 0

24. *„* 0

25. *„* 0

26. *„* 0

27. *„* 0

28. *„* 0

29. *„* 0

30. *„* 0

31. *„* 0

32. *„* 0

33. *„* 0

34. *„* 0

35. *„* 0

36. *„* 0

37. *„* 0

38. *„* 0

39. *„* 0

40. *„* 0

41. *„* 0

42. *„* 0

43. *„* 0

44. *„* 0

24th. Sold to Alexander Pope 2 Pipes
 of Wine 120 0 0

„ Bought of William Paley 60
 Pipes of Wine 1,200 0 0

„ Received Cash, for Bill Receiv-
 able on hand, 1st January, due
 this day 100 0 0

28th. Paid Cash, acceptance in favour
 of James Thompson, due this
 day 550 0 0

29th. Received Cash of Alexander
 Pope 40 0 0

„ Sold to H. Bardolph, 10 Pipes
 of Wine 450 0 0

30th. Received of H. Bardolph, Cash
 on account 200 0 0

„ Bought, and paid for the same
 in Cash, 15 Pipes of Wine ... 600 0 0

„ Paid Cash: Rent of Counting-
 house 7 0 0

„ Ditto: Clerk's Salary 10 0 0

31st. Interest on Capital accrued to
 this date: one month at 5 per
 cent. per annum on £2,000 ... 8 6 8

„ Drew out Cash for private pur-
 poses 100 0 0

„ Stock of Wine on hand at this
 date 2,500 0 0

Note.—Candidates who reply to No. 17 need not reply
 to No. 9, No. 10, No. 11, nor No. 12; but "SATISFAC-
 TORY ANSWERING" in No. 17 will be deemed an in-
 dispensable condition of a "HIGH DEGREE OF EXCEL-
 LENCE."

ALGEBRA.

THREE HOURS ALLOWED.

The Candidates are recommended not to attempt any
 of the questions in the second portion of the paper,
 marked B, until they have answered as completely as
 they can those in the first portion, marked A.

A.

1. Illustrate and explain the rule which is expressed
 by the formula, $-a \times -b = +ab$.

2. What is meant by the *Greatest Common Measure* of
 two algebraical quantities?

If R be the greatest common measure of two polynomi-
 als P and Q , it is also the greatest common measure
 of $P+Q$ and $P-Q$.

3. Find the Least Common Multiple of
 $a^2+2ab-b^2$ and $a^2-2ab-b^2$.
 Also of a^2-b^2 , $(a+b)^2$, and $a^2+ab-2b^2$.

4. Divide x^5+y^5 by $x+y$; and prove that x^n+y^n is
 always divisible by $x+y$, if n be an odd number.

5. Extract the cube root of
 $x^3-6x^2+21x^4-44x^3+63x^2-54x+27$.

6. Reduce the following expressions to their simplest
 forms:

$$\frac{x^2-3x+2}{x^3-x^2-x-2};$$

$$\frac{1}{x-1} - \frac{x+1}{x^2+x+1} - \frac{x}{x^2-1};$$

$$\frac{1}{x} + \frac{x-5}{x(x+1)} + \frac{x+8}{x(x+1)(x+2)}.$$

7. Solve the following equations:

$$\frac{x-a}{x-b} + \frac{x-c}{x-d} = \frac{a}{b} + \frac{c}{d} \quad (a)$$

$$(x-1)(x-2)(x-3)(x-4)(x-5)(x-6)(x-7)(x-8)(x-9)(x-10) = 11 \quad (\beta)$$

$$\begin{cases} x^2+xy+y^2=7 \\ xy-x^2=1 \end{cases} \quad (\gamma)$$

8. A ratio of greater inequality is increased by taking
 from both terms of the ratio any quantity which is less
 than each of those terms.

What quantity must be taken from each term of the ratio $a+b : a-b$, to increase it to three times its value?

9. There is a number consisting of two digits, and it is such that if the first digit be doubled it exceeds the second by unity, and that the difference of the squares of the digits is equal to the square of half their sum. Find the number.

Is there anything superfluous in this question?

10. When is one quantity said to vary as another? Give examples illustrative of your definition.

The space through which a heavy body falls from rest varies as the square of the time of falling; and in one second a body falls through 16.1 feet. Find the time in which a body will fall to the ground from the top of St. Paul's, the height being 404 feet.

B.

11. Reduce to its simplest form the expression :

$$\frac{a^2+bc}{(a-b)(a-c)} + \frac{b^2+ca}{(b-c)(b-a)} + \frac{c^2+ab}{(c-a)(c-b)};$$

and express the fraction $\frac{x(x+1)(x+2)}{x(x+1)(x+2)}$ as the sum of three fractions, having for their denominators x , $x+1$, and $x+2$ respectively.

12. Solve the following equations:

$$x^4+x^3+x^2+x+1=0 \quad (\alpha)$$

$$x^4+2x^3+x^2+2x+1=0 \quad (\beta)$$

$$x^3+y^3+z^3=1 \quad (\gamma)$$

13. There is a certain whole number, which being increased by the integral part of its square root becomes equal to 15. Find the number.

14. Distinguish between *Arithmetical* and *Symbolical* Algebra. Is the equation $a^m \times a^n = a^{m+n}$ assumed or proved? What is the meaning of the formula $a^0=1$?

15. A quadratic equation cannot have more than two roots.

In the equation $x^2 - px - q = 0$, if q be a positive quantity, what conclusion can you draw respecting the nature of the roots?

16. If $ax+by \propto x$, and $a^2x^2+b^2y^2 \propto x^2$, then

$$\frac{x^2}{y} + \frac{y^2}{x} \propto \frac{x^2}{x+y}.$$

17. The square root of a certain number consists of $2p+1$ digits; prove that if $p+1$ of them have been obtained by the ordinary process, the remaining p may be found by division only.

Can you enunciate an analogous proposition for the extraction of the cube root?

18. A man buys pigs, geese, and ducks. If the geese had cost a shilling a-piece less, one pig would have been worth as many geese as each goose is actually worth shillings. A goose is worth as much as four ducks, and twenty ducks are worth five shillings more than half a pig. Find the price of a pig, a goose, and a duck respectively.

19. A and B run a race of a mile. A gives B a start of n yards and beats him by t seconds. In the next race A gives B a start of t' seconds and is beaten by n' yards. In what time can A and B respectively run a mile?

20. If a be any quantity which satisfies the equation

$$x^n + x^{n-1} + x^{n-2} + \dots + x^2 + x + 1 = 0,$$

then $a^{n+1} = 1$.

GEOMETRY.

THREE HOURS ALLOWED.

SECTION I.

1. Upon the same base and upon the same side of it there cannot be two triangles which have their sides terminated in one extremity of the base equal to one another, and likewise the sides which are terminated in the other at principle in the practice of carpentry of this proposition?

2. If a straight line be divided into two equal, and also into two unequal parts; the squares of the two unequal parts are together double of the square of half the line, and of the square of the line between the points of section.

3. Describe a square that shall be equal to a given rectilineal figure.

4. Two circles cannot touch one another in more than one point, or intersect one another in more than two points.

5. In equal circles the angles which stand upon equal circumferences are equal. Can the same straight line cut off similar segments of concentric circles?

6. Inscribe a circle in a given triangle; and also in a given Rhombus.

7. Describe a regular pentagon about a given circle.

8. The sides about the equal angles of equiangular triangles are proportionals.

9. If four straight lines be proportionals, the rectangle contained by the means is equal to the rectangle contained by the extremes.

10. Draw three straight lines which shall be in harmonic proportion.

11. If a straight line be at right angles to a plane, every plane which passes through it shall be at right angles to the plane.

12. If each of two solid angles be contained by the plane angles which are equal to one another, each of each, the planes in which the equal angles are have the same inclination to each other.

SECTION II.

1. If the opposite sides of a quadrilateral figure be equal to one another, the figure is a parallelogram.

2. Produce a line so that the rectangle of the whole line so produced and the original line shall be equal to a given square.

3. Upon a given straight line describe a triangle the shall be equal to a given rectilineal figure, and have one angle equal to a given rectilineal angle.

4. ABC is an isosceles triangle. In the base BC take any point D , the circle described through A, B, D is equal to the circle described through A, C, D .

5. Through a given point without a circle draw a straight line which shall divide the circle into two segments—such that the difference of the angles they contain shall be equal to a given angle.

6. Investigate the conditions under which a quadrilateral figure which can be inscribed in a circle can also have a circle inscribed in it.

7. From the centre of the inscribed circle of an equilateral triangle, a circle is described with radius equal to half the side of the triangle. Show that the tangents to this circle from the three angles form a regular hexagon.

8. How would you proceed in order to show by superposition that the square of the hypotenuse of a right-angled triangle is equal to the sum of the squares on the sides?

9. If two spheres intersect, their common section is a circle.

10. The orthographic projection of a cube on a plane perpendicular to its diagonal is a regular hexagon.

11. If through a given point within a triangle, lines be drawn from the angles to the opposite sides, and the points of section be joined, the first three lines will be harmonically divided.

12. A person travelling along a straight line of sight sees the sun's image reflected in a polished sphere. What is the path of the image on the sphere?

MENSURATION.

THREE HOURS ALLOWED.

1. Show how with a ruler and compasses to find the centre of a circle, and to describe a circle through three given points,

2. On an Ordnance Map of 6 inches to a mile the chord of a railway curve measures 4.654 inches, and its height $\frac{1}{4}$ an inch; what is the radius of the curve on the Map, and in reality?

3. If the chord of half the curve mentioned in the former question be 2.35 inches, what distance is lost by making the curve instead of going straight?

4. Two arcs of different circles are of the same length; they subtend angles of 15deg. 39m. 7sec., and 56deg. 9m. 43sec. respectively; the radius of one circle is 7.75 inches: what is the radius of the other?

5. The sides of a triangle are 7, 13, 18 feet; what is the area? What will be the area of a triangle whose sides are respectively double the above?

6. Find the area of a hexagonal field A, B, C, D, E, F , of which the sides reckoned from A are 26, 28, 18, 10, 16, 18, yards respectively, where the diagonal $AC=24$ yards, and the perpendicular from E falls upon the middle point of AC , and $=8$ yards.

7. What is the solid content of a frustum of a cone, the height of which is 1 foot 3 inches, and the diameters of its ends 2 feet, and 1 foot 8 inches, respectively?

8. Explain the Sliding or Carpenter's Rule.

9. A piece of timber is 12 feet 9 inches long, $\left\{ \begin{array}{l} 1 \text{ foot } 6 \text{ inches,} \\ 1 \text{ foot } 3 \text{ inches,} \end{array} \right\}$ broad, and $\left\{ \begin{array}{l} 1 \text{ foot } 4 \frac{1}{2} \text{ inches,} \\ 9 \text{ inches,} \end{array} \right\}$ thick at the $\left\{ \begin{array}{l} \text{larger} \\ \text{smaller} \end{array} \right\}$ end; what is its solid content?

10. Define the term *quarter girt*. And what would be the mean quarter girt of the above piece of timber?

11. What will be the cost of building a wall, with a triangular gable on it of 15 feet, the height of the wall being 48 feet, the breadth of it 42 feet 6 inches, and the thickness $5 \frac{1}{2}$ bricks, at 36s. per rod, of $272 \frac{1}{2}$ square feet?

12. How much plastering will there be in a room 15 feet long, 12 feet broad, and 9 feet 6 inches high, exclusive of skirting and cornice, there being two doors of 6 feet 3 inches by 2 feet 10 inches, and a window of 4 feet by 5 feet 3 inches? And what will be the cost at 5d. per square yard?

13. What will be the cost of the lead for a gutter down two equal slopes of a roof, the height of which is 17 feet, and span 24 feet, at 3d. per lb., supposing each yard to contain 18 lbs.?

14. What would be the cost of glazing a triangular skylight, the base of which is 12 feet 3 inches, and the height 5 feet 9 inches, at 1s. 4d., per square foot?

15. Show how to determine the content of a cask, considered as the middle zone of a sphere; and find the content in gallons when the diameters of the top and bottom are 4 feet 10 inches, and its height 4 feet 6 inches, inside measure.

16. Explain the term *specific gravity*. The sides of two cubes are as 3:4, their specific gravities as 2:3; compare their weights.

17. Two cubical boxes of oak, 5 inches in the side, outside measure, contain mercury and lead respectively; the thickness of the first box is 1 inch; what must be the approximate thickness of the other, in order that both may be of the same weight; the specific gravities of the substances being mercury 13.6, lead 11.325, oak .925.

18. Explain accurately the principles of levelling, with corrections for curvature and refraction, and the method by which the necessity for the latter is avoided.

19. From the following notes, plan and find the content of a field.

	to $\odot C$	
	3160	
	2438	
$B \ 1125$	1050	
Begin	at $\odot A$	960 D
		Range East.

20. Also the following:—

	to $\odot D$	
	490	
	260	
	188	
$G \ 100$	Go to $\odot F$	75 E
	to $\odot G$	
	420	
	148	
$D \ 210$	L of $\odot C$	
	to $\odot C$	
	475	
	375	
$B \ 160$	144	
Begin	at $\odot A$	120 G
		Range N

TRIGONOMETRY.

THREE HOURS ALLOWED.

1. Define sine, tangent, secant, degree; and explain the difference between a geographical degree and a trigonometrical degree.

2. Prove that $\sin A = \sin (180^\circ - A)$; $\cos A = -\cos (180^\circ - A)$; find the sine and tangent of 60° .

3. Prove the following equivalents:

$$(1.) \sin (A+B) = \sin A \cos B + \sin B \cos A.$$

$$(2.) 2 \cos A \cos B = \cos (A+B) + \cos (A-B).$$

$$(3.) \tan (45^\circ + A) + \cot (45^\circ + A) = 2 \sec 2A.$$

4. If $\sin B = m \sin (2A+B)$, prove that $\tan (A+B) = \frac{1-m}{1+m} \tan A$.

5. Prove that $4 \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{239} = 45^\circ$.

6. Find the values that A admits of in the equation

$$\sin 4A + \cos 4A = \left(\frac{3}{2}\right)^{\frac{1}{2}}.$$

7. If a, b, c are the sides and A, B, C are the angles of a plane triangle, prove that

$$(1.) \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$(2.) \cot A + \cot B + \cot C = \cot A \cot B \cot C + \operatorname{cosec} A \operatorname{cosec} B \operatorname{cosec} C$$

$$(3.) \tan \frac{A}{2} + \tan \frac{B}{2} = \frac{a+b-c}{a+b+c}$$

8. Explain the ambiguous case in the solution of plane triangles.

9. Solve the following triangle:

$$B=39^\circ 15'; C=45^\circ; AB=100; \log \cos 5^\circ 45' = 9.9978098; \log \sin C = 9.8494860, \text{ and } .1483243 = \log 1.407.$$

10. Explain the process of solution with the help of logarithmic tables of a plane triangle when two sides and the included angle are given.

11. Define logarithm; logarithmic base; and state the convenience of taking 10 as the base for tabulated logarithms. What is the Napierian base, and what is its numerical value?

12. On what principle are the tables of differences and proportional parts formed? If $\log 72.754 = 1.8618569$ and $\log 727.53 = 2.8618509$, find the logarithm of .7275392.

13. Define angle of a spherical triangle; and show that the sum of the angles of a spherical triangle is greater than two right angles, and less than six.

14. The sides of a spherical triangle being given, it is required to determine the cosines of the angles.

15. By what means can the formula for plane triangles be deduced from those for spherical triangles?

16. Enunciate Napier's rules for the circular parts

right-angled plane triangle; and prove that $\sin A = \sin C$
 $\sin A$; $\cos B = \cot C \tan A$.

17. Two angles and a side opposite to one of them are given in an oblique spherical triangle: show how to determine the other parts of the triangle.

18. Explain the method of calculating the angular distance of two given stars by means of the Theodolite.

CONIC SECTIONS.

THREE HOURS ALLOWED.

1. Define the (1) Ellipse, (2) Parabola, and (3) Hyperbola, as they arise from different sections of a cone: and hence show that particular species of (1) are a circle and a point; of (2) are two parallel straight lines and one straight line; of (3) are two intersecting straight lines.

2. Prove that the Latus rectum of a Parabola is four times the distance of the Focus from the Vertex; and that the Subnormal is half the Latus rectum.

3. A tangent is drawn to a Parabola at a point P , and intersects the tangent at the vertex in the point Y , and the diameter through the vertex in the point T ; S is the focus; it is required to prove that SY is perpendicular to PT ; and that $SP = ST$.

4. Show that the Parameter of any diameter of a Parabola is four times the distance of the origin of that diameter from the focus.

5. A Parabola being drawn on a plane, it is required to find its vertex, focus and directrix.

6. Define focus and eccentricity of an Ellipse; and determine the relation between the distance between the foci and the axes of the curve.

7. Prove that a tangent to an Ellipse at a given point cuts the major axis produced in a point whose distance from the centre is independent of the minor axis of the Ellipse.

8. Perpendiculars are drawn from the foci of an Ellipse on a tangent; prove that the distances of the points of intersection from the centre are equal to each other, and to the same major axis.

9. Define conjugate diameters of an Ellipse; and show that the sum of their squares is constant.

10. Draw a tangent to an Ellipse from a point (1) on it, (2) without it, by means of a ruler only.

11. Explain the elliptic compasses, or any other machine for a description of an Ellipse. How is a lathe ordinarily adapted to elliptic turnings?

12. By the method of proportions prove that:—

(1) The locus of the middle points of parallel chords of an Ellipse is a straight line.

(2) The area of the Ellipse $= \pi ab$.

13. Prove that in a Hyperbola the difference of the focal distances is equal to the transverse axis.

14. The tangents at the extremities of a focal chord of a Hyperbola intersect in the directrix.

15. Define the asymptotes of a Hyperbola; and if a straight line is drawn cutting the Hyperbola and its asymptotes; show that the intercepts between the curve and the asymptotes are equal.

16. Prove that the area of the triangle between the asymptotes of a Hyperbola and a tangent at any point is constant.

17. Show by the method of infinitesimals that an Ellipse is cut at right angles by a confocal Hyperbola.

18. A part of a conic curve is traced on a plane; determine to which of the three conic sections it belongs.

19. Two parallel tangents being drawn to an Ellipse, show that the rectangle contained by the parts of them intercepted between any other tangent and the points of contact is constant.

20. How many normals can generally be drawn to a Parabola from a given point? Find the locus of the point from which two, and no more than two, normals can be drawn.

NAVIGATION AND NAUTICAL ASTRONOMY.

THREE HOURS ALLOWED.

One question to be answered in each Section.

(1)

1. Define the following lines of the Terrestrial Sphere, meridians, parallels of latitude, equator, rumb-line; and show that every section of a sphere by a plane is a circle. When does the rumb-line become a circle?

2. What is meant by "Plane sailing?" Is the difference of latitude found correctly from its principles?

3. Prove that the like parts of two parallels of latitude have the same ratio as the cosines of their latitudes.

(2)

1. Prove; Departure \times Sec. middle latitude $=$ Difference of Longitude, and

Tan. Course $=$ Diff. Long. \times Cos. Mid. Lat.
Diff. Lat.

2. What are "Meridional Parts?" What is the value of 1 second of latitude on Mercator's Chart in latitude 60 deg.?

3. What are the advantages of "Great circle sailing?" And what are the practical objections to it?

(3)

1. Investigate a method of finding the distance between two places on a great circle.

2. What is meant by the "Variation of the Compass?" And what is "Local deviation?" How are they allowed for on the compass course?

3. What is the distinction between the "Course from A to B" and the "Bearing of B from A?"

(4)

1. State the direction in which the wind turns in a Cyclone in the North Atlantic Ocean:—and the general track of these Cyclones.

2. Give a rule for finding the bearing of the centre of the Cyclone.

3. In a North Atlantic Cyclone progressing to the North-Eastward, state the successive shifts of wind experienced by a ship lying-to on the North side of the storm's track.

(5)

1. Explain the corrections which must be applied to the observed altitude of the Sun to obtain the true altitude. In what order should they be applied?

2. Define the sensible and rational horizons; and prove that the dip of the Sea-horizon varies with the square root of the height of the eye.

3. Investigate the expression for the augmentation of the Moon's semi-diameter.

(6)

1. Explain the method of finding the latitude of a place from the observed meridian altitude of a heavenly body.

2. Explain in a simple manner the principle of the method of finding the longitude by lunar observation. How may a chronometer be rated by Lunars?

3. When will an error in the observed altitude produce the least effect on the time deduced from it: and why?

(7)

1. Explain the principle of the sextant; and its principal adjustments.

2. What is meant by the "index error;" and how is it determined?

3. Make a sketch of the vernier and the adjacent divisions of the scale of a barometer when it reads 30.2 inches.

(8)

1. What is a "sidereal day?"—a "solar day?"—a "mean solar day?"

2. What is the difference between the sidereal time and apparent solar time? When do they agree?

3. Explain the contents of the column headed "Sidereal time" at page 11, for each month in the Nautical Almanack. Why is it sometimes called the "Right ascension of the mean sun?"

(9)

1. Investigate a formula for computing the altitude of the sun for a given Greenwich date.

2. Investigate a method of clearing the Lunar distance from the effects of parallax and refraction. Explain the correction for the spheroidal figure of the earth.

3. Investigate a method of finding the latitude from the altitudes of a celestial object near the meridian. Show how the "Hour-angles" are computed from "the times by chronometer" for the sun or a fixed star.

(10)

1. Investigate the formula for computing the meridional parts.

2. Show that the "meridional parts" corresponding to the latitude of the most eastward or westward point of a circular island are a mean between those of its most northward and southward points.

3. In a circle of a cyclone, at a given distance from its centre, show how to compute the difference between those parts of its circumference in which the winds are respectively easterly and westerly. And show from your formula that there is no easterly wind when the circumference passes through either pole.

PRACTICAL QUESTIONS.

To be answered in order.

1. A ship sails from latitude 50 deg. 21 min. N.; longitude 85 deg. 0 min. W. on the following true courses:—N.W. 26 miles, N.N.W. 33, and S.W. by W. 50, and W.S.W. 29, required her latitude and longitude.

2. On April 21st, 1858, the meridian altitude of Aldebaran = 31 deg. 18 min. 20 sec.: the star south of the Zenith, Index Correction = 0 min. 45 sec., and height of the eye above the sea 18 feet; required the latitude.

3. Required the Sun's amplitude at rising on June 18th, 1858, in latitude 51 deg. 28 min. N.

4. February 10th, 1858, at about 9h. 35m. p.m. mean time, in latitude 36 deg. 50 min. N., longitude by account 137 deg. 15 min. W., when a chronometer showed 8h. 18m. 34s., the observed altitude of α Leonis was 42 deg. 36 min. 50 sec., index error = 2 min. 25 sec.; height of the eye 17 feet: required the longitude. On January 23rd at noon the chronometer was fast on G.M.T. 1h. 35m. 15s. gaining daily 2.5 seconds.

5. If on November 19th, 1858, the Sun be observed to have equal altitudes in the morning and afternoon at a place in latitude 42 deg. 52 min. S., and longitude 147 deg. 25 min. E., when a chronometer shows 10h. 49m. 23s. and 3h. 36m. 37s., required the error of the chronometer for mean time at the place at noon.

6. By the Nautical Almanac the distances of the Moon's centre from Pollux at 3h. and at 6h. mean Greenwich time, on Sept. 2nd, 1861, are 20 deg. 26 min. 37 sec. and 22 deg. 3 min. 8 sec., required the time when the distance is 21 deg. 30 min. 31 sec.

(To be continued.)

SCIENTIFIC CONGRESS AT CARLSRUHE.

The twenty-fourth meeting of the German Naturalists and Physicians is fixed to be held at Karlsruhe from the 16th to the 22nd of September next, under the presidency and direction of Messrs. Eisenlohr, Aulic Councillor and Professor of Physics at the Polytechnic School, and Boltzert, one of the Council of Physicians. It is expected that this meeting will take place under peculiarly favourable circumstances. Nearly all the noted philosophers of Germany have announced their intention of attending; Von Liebig, Bunsen, Argelander, Wöhler, Erman, Dove, Ettinghausen, &c.

SOUTH KENSINGTON MUSEUM.

During the week ending 10th July, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,697; on Monday and Tuesday (free evenings), 4,028. On the three Students' days (admission to the public 6d.), 972; one Students' evening, Wednesday, 106. Total, 8,803.

THE LONDON MECHANICS' INSTITUTION.

The following communication has been received from the Committee of this Institution:—

"The report of Dr. Lyon Playfair on the London Mechanics' Institution, ordered by the House of Commons to be printed (26th of March last), having thus been made public, and an able article thereon having appeared in *The Times*, followed by the notices of other journals, the Committee of Managers, after due consideration and examination of the various statements made, deem it but justice to the Institution and themselves to make a statement of facts to give the public a more entire and just view of the position of the Institution than would otherwise be obtained.

"The committee admit and deeply regret that the financial difficulties of the Institution have prevented it from continuing classes for instruction in many subjects of art and science, of great utility in themselves, but requiring competent and well-paid professors, and that the same cause has prevented the general character of its instruction being kept up to that standard of efficiency which they feel to be of the utmost importance, and which the advancing spirit of the age imperatively demands. They are, however, fully sensible that, even without money difficulties, the Institution could not be expected to compete with the high standard of University and Collegiate institutions now offered to the public, probably in a large degree through the very influence and example of the London Mechanics' Institution.

"They believe, however, that it may be made a good preparatory school for such higher institutions to those who have not had preparation at other establishments, or for adults, who would not wish to enter a youthful assembly; and that hitherto it has met, and may meet, the wants of artisans, tradesmen, apprentices, clerks, and the numerous class of confidentially employed persons forming the great mass of the young men of London, who, unable to enter upon a thoroughly scholastic curriculum, may at a small expense pursue two or three branches of study, and thus secure at once the improvement of their minds, assistance in their business from the bearings of their study, and that advancement in social position which is almost inseparably connected with mental culture. These are useful occupations of time for evenings which otherwise might be spent in mere pleasure seeking, and cannot fail to mitigate the social evils which are now the objects of so much public attention.

"The committee also consider that while provision is made for such studies as require close and vigorous mental application, it is equally important that the wants of the large class whose daily avocations involve mental care and anxiety should be met by useful studies of a less severe kind—music, elocution, the various branches of drawing, &c. The same remark applies to the selection of lectures. The rule has been to secure four lectures in the departments of science, literature, and music, alternating through the quarter, and the most eminent literary and scientific men have been and are engaged for the lecture-hall.

"The committee can scarcely agree, nor do they think the public will agree with the opinion expressed in Dr. Playfair's report, that the classes of arithmetic, mathematics, book-keeping, chemistry, anatomy, landscape, architectural, and mechanical drawing, and human figure drawing, French, writing, and elocution, being all of

Post will allow of parcels being securely packed; they need not, as now, be left open at the ends, and there will be no occasion at the Post-office to "inspect" them, by cutting off the wrapper, which appears to be the rule prescribed in doubtful cases.

But there is an important defect in the Post-office system in carrying parcels, which the public ought to insist upon having corrected. The railway companies are liable to the owner for the value of any parcel whilst it is *in transitu*,—why should not the Post-office be also liable? Although I have had but few books lost in their transmission through the post, I must add that, from whatever cause it is, I have never been able to recover one which had been so lost. There ought to be the opportunity given to the owners of identifying their property, and of recovering it without so much time being wasted, and so much trouble given, in the investigation, which generally ends in disappointment. The number of books constantly "in warehouse" at the Post-office, shows that in the details of business, on which, after all, no little of the good of any institution depends, there is a want of skill, of energy, or of power. I should propose, as a remedy for their safe transmission, a uniform rate of insurance on all parcels of one halfpenny more penny up to a certain amount, the owner to have the right of recovery on proof of ownership and value; beyond this fixed value a per-centage insurance sufficient to cover risk; an insurance stamp to be affixed in all cases, before or on delivery to the Post-office agents. At present the Post-office is not liable for any loss. It is at this time, however, to explode the popular notion that registered letter containing property is *insured* by paying sixpence in exchange for the receipt of the Post-office agent. There is a good deal of red tape still in use at the General Post-office.

I am, &c.,

JOHN PETHERAM.

London, July 12, 1858.

As,—Highly appreciating the labours of the committee on the Small Parcels Post, I feel it important to convey every ray of information on this subject, and every objection occurring to individuals, should be furnished to the committee.

The advantage of such a means of conveying small parcels would be very great to me, if anything like security could be obtained for safe transmission, which experience convinces me does not exist in the present arrangements, for quite 10 per cent. of the parcels sent through the Post-office have been lost; this has induced me to send, where possible, through small parcels conveyances; in them I have never lost a single parcel, although I have sent many times the number that I have sent through the post.

It is true that the Post-office offers an additional security in its system of registration, but the charge for registering is much too high for general adoption, as the cost of carriage must be borne by profits, which upon parcels of average value frequently do not exceed one shilling or one shilling and sixpence, and are very often much less. This I can illustrate in the case of two letters which I lost in June last. One contained a sample of metal of nominal value only, sent as a pattern to A, with order; this was lost. The other, sent about the same time, contained silver to the value of 35s., sent to an artist, B, for work, for which his charge was 2s. 6d., with instructions to return it in A's parcel. This could not be done, as A, not having received the order, had not sent the parcel to send; therefore, B sent the silver by post, which it was lost, he having paid sixpence, making, with the former charge, one shilling for postage, and if the two letters had been registered, that charge would have been doubled, while the whole possible profit arising from the work performed was two shillings and sixpence. This great obstacle to the transmission of parcels by the Post-office I think might be removed by a more moderate

charge for registration, or by an equitable insurance, which is an important consideration, for the usefulness of the Parcels Post will be limited by the amount of the charges, while the success of the scheme must wholly depend upon the extent of its use by the public.

I am, &c.,

E. NASH.

30, Coppice-row, E.C., July 13, 1858.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 6th July, 1858.

- 98 (a4). Poor-rates and Pauperism—Return (A).
- 376. Endowed Schools (Ireland)—Return.
- 261 (1). Colonization, &c. (India)—Map.
- 137. Bills—New Trial in Criminal Cases.
- 169. ——— Titles to Land (Scotland) (Amended).
- 176. ——— Government of India (No. 3) (Amended).
- Ordnance Survey Commission—Report.

Delivered on 7th July, 1858.

- 382. East India (Transport of Troops)—Report from Committee.
- 386. Education (Ireland)—Copies of Report, &c., relating to J. W. Kavanagh, Esq.
- 379. Bills—Universities (Scotland) (as amended in Committee, on Re-commitment, and on consideration of Bill, as Amended).
- 181. ——— Legitimacy Declaration (Amended).

Delivered on 8th July, 1858.

- 363. Billetting System—Report from Committee.
- 375. Coals (Woolwich and Portsmouth)—Return.
- 190. Bill—Sale and Transfer of Land (Ireland) (as amended in Committee and on Re-commitment).
- Discovery of Gold (Fraser's River District)—Correspondence.

Delivered on 9th July, 1858.

- 365. Fire Insurances—Return.
- 399. Mines under the Sea (Cornwall)—Papers.
- 400. Wellington Monument—Copy of Report.
- 388. St. Helena and Hong Kong—Return.
- 182. Bills—Endowed Schools &c. Amendment.
- 166. ——— Bishops' Trusts Substitution (amended).
- Railways of the United States—Supplement to Capt. Galton's Report.

Delivered on 10th and 12th July, 1858.

- 393. Gas (Metropolis)—Report from Committee.
- 402. Public Income and Expenditure (year ended 30th June, 1858)—Account.
- 162 (7). Civil Services—Estimates (Class 7).
- 347. Ramsgate Harbour—Abstract of Accounts.
- 384. Metropolitan Police—Return.
- 392. East India (Administration of Justice)—Return.
- 389. German Emigration (Cape of Good Hope)—Return.
- 352. Loans (Public Works)—Return.
- 187. Bills—Municipal Franchise (Lords Amendments).
- 192. ——— Railway Cheap Trains.
- 188. ——— Local Government (as amended in Committee and on Re-commitment).
- 189. ——— New Writs.
- 190. ——— Rateable Property (Ireland).
- 191. ——— Gaols and Houses of Correction Act Amendment.
- Netley Hospital—Report of the Site, &c.

Delivered on 13th July, 1858.

- 366. Forgery, &c.—Return.
- 364. Metropolitan Turnpike Trusts—Return.
- 370. Ordnance Survey—Map.
- 406. Bothnia—Return.
- 344. Harbour of Refuge—Report and Evidence.
- 187. Bills—Municipal Franchise (Lords Amendments) (a corrected Copy).
- 193. ——— Chinese Passenger Act (1855) Amendment.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, July 9, 1858.]

Dated 4th March, 1858.

- 430. W. Wilkinson, Bayswater—Imp. in machinery and apparatuses for spinning threads, for preparing threads, for weaving and knitting, for covering cores with fibrous and other materials, and for making ropes, parts of which are applicable as pulleys, reels, and bobbins.

Dated 19th April, 1858.

- 776. J. Oxley, Beverley, Yorkshire—Certain imp. in the doors and seats of carriages.

Dated 18th June, 1858.

1360. B. Pitt, 4, Great Carter-lane, Doctors'-commons—Imp. in the construction of knobs and roses used with locks, latches, and such like fastenings as are constructed with spindles.
1362. Baron F. Julius, Wedel-Jarlsberg, Frederikswærn, Norway—An improved self-registering compass or control compass.
1364. Sir F. C. Knowles, Bart., Lovell-hill, Berkshire—Imp. in the fabrication or manufacture of steel.
1366. A. Dembinsky, Islington, and A. C. Engert, City-road—An improved fire-proof composition or wash.

Dated 16th June, 1858.

1358. B. Predavalle, 470, New Oxford-street, Bloomsbury—Imp. in the mode of obtaining motive power.
1362. W. Sawney, Beverley—Imp. in apparatus applicable to screening, winnowing, and corn-dressing machines.
1364. J. H. Dickson, Stanley-terrace, Rotherhithe—Imp. in machinery or apparatus for scutching and hecking flax, hemp, and other similar fibrous materials.
1366. J. Westwood, London-yard, Isle of Dogs, Poplar—Imp. in the construction of iron ships.
1368. T. Steven, Glasgow—Imp. in making moulds for casting.

Dated 17th June, 1858.

1370. F. Walton, Wolverhampton—A new or improved manufacture of japanned wares.
1372. J. Allardice, Glasgow, and W. Miller, Blantyre, Lanark, N.B.—Imp. in gaeblers.
1374. G. Hale, Tavistock-street, Covent-garden—Improved apparatus for obtaining motive power.
1376. C. Crookford, Holywell, Flintshire—Imp. in the treatment of the ores of zinc, and in spelter making.

Dated 18th June, 1858.

1378. J. Shaw, Chesapeake, Leicester—Imp. in fire-arms.
1380. W. Spence, 60, Chancery-lane—Imp. in clogs, shoes, or supports for the feet. (A. com.)
- Dated 19th June, 1858.*
1382. F. G. Spillsbury, Dresden, Saxony—Making tungstic acid and certain of its salts, and for using the same to decolour acetic acid and its compounds.
1388. R. Winans and T. Winans, Baltimore, U.S.—A new and useful imp. in the form of the hulls of steam vessels.
1388. R. Winans and T. Winans, Baltimore, U.S.—A new and useful imp. in ocean steamers.
1390. R. Haildon, Willenhall, Staffordshire—Certain imp. connected with engines worked by steam or atmospheric power.

Dated 21st June, 1858.

1392. Sir J. C. Anderson, Bart., Fermoyley—Imp. in locomotion, parts of which are applicable for other purposes.
1394. R. A. Brooman, 166, Fleet-street—Imp. in steam cocks. (A. com.)
1396. J. J. Lawder, Lieut. and Brevet Capt. in the Honourable the East India Company's Army—A method of supporting or carrying knapsacks, packs, and other weights on the back.
1398. W. C. Wilkins, Long Acre—Imp. in lamps.
1400. W. E. Newton, 66, Chancery-lane—An improved method of affecting the separation of the fibres of wood for the manufacture of paper therefrom, which is also applicable to the separation of the fibres of flax or other substances, for the manufacture of textile fabrics, and also to the separation of other substances for similar or other purposes. (A. com.)
1402. W. E. Newton, 66, Chancery-lane—Imp. in the process and machinery for obtaining from waste and refuse felted fabrics of wool, fur, or other materials, fibres in a suitable condition for being worked into felt and other fabrics. (A. com.)
1404. H. Deacon, Widnes Dock, near Warrington, Lancashire—Imp. in purifying alkaline lyes.

Dated 22nd June, 1858.

1406. G. Schaub, Birmingham—Imp. in the manufacture of door plates, sign-boards, and other surfaces, having inscriptions, designs, or ornaments thereon, and in the manufacture of detached letters, designs, and ornaments to be affixed to walls and sign-boards, or used for other like purposes.
1408. J. Fynn, Trinity-square, Surrey—Imp. in machinery for felling trees.
1410. W. E. Kenworthy, Water-lane, Leeds—Imp. in manufacture of steel.
1412. E. Cookey, H. Cookey, and F. C. Cookey, Frome, Somerset—Imp. in apparatus employed in the manufacture of cheese.

Dated 23rd June, 1858.

1414. S. Barlow, Stakehill, near Middleton, Lancashire—Imp. in machinery or apparatus for bleaching or cleansing textile fabrics or materials.
1416. C. Vero and James Everitt, Atherstone, Warwickshire—Imp. in the manufacture of hats.
1418. W. Clibran and J. Clibran, Manchester—Imp. in apparatus or arrangements for distributing, governing the pressure of, and lighting gas.

1420. Sir J. Paxton, M.P., Rock Hill, Sydenham—Imp. in the manufacture of horticultural buildings or glass structures for horticultural and other purposes.

1422. W. E. Newton, 66, Chancery-lane—Certain imp. in centrifugal governors for steam engines and other motors. (A. com.)

Dated 24th June, 1858.

1423. C. Bordas, 8, Upper Stamford-street, Blackfriars-road—Imp. in the mode or method of producing embroidery.
1424. J. Bates and J. York, Hyde, Chester, and W. Parkin, Stethal—Imps. in platons and plungers.
1426. G. Collier, Halifax—Imp. in means or apparatus for the stretching and drying of woven fabrics.
1428. W. E. Newton, 66, Chancery-lane—Improved machinery in manufacturing friction matches. (A. com.)

Dated 25th June, 1858.

1432. J. Betts, Strand—Imp. in obtaining surfaces on which to print maps and other designs.
1434. T. Booth, Rahere-street, Goswell-road—Imp. in monthly and fitting wheels and axles to carriages, which imp. are applicable to pulleys and other parts moving on axes.
1436. J. Maudslay, Lambeth—An imp. in the construction of machines for melting iron, steel, and other metals.
1438. J. Taylor, Swanton Noyers, Thetford, Norfolk—An imp. in the construction of horse-hoes, applicable also to drills.

Dated 26th June, 1858.

1442. S. Whitehall, Jaquard Works, Hunsington-street, Nottingham—Certain imp. in finishing lace and other fabrics.
1444. J. A. Manning, Inner Temple—An improved mode of intercepting and treating the sewage of London, and towns and cities similarly situated.
1446. D. Campbell, Wemyss Castle, Kirkcaldy, Fifeshire—A new grubbing and harrowing land roller.
1448. E. E. D'Heurle, Paris—Imp. in boxes for keeping and measuring coffee, tea, and other substances requiring to be preserved from contact of the air.
1450. C. Erhard, 7, Rue des Navarin, Paris—Imp. in apparatus for boring wells. (A. com.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1431. C. W. Cahoon, Maine, U.S.—An improved machine for sowing seed or fertilizing material or other substances broadcast—24th June, 1858.
1440. T. Lemon, Duke street, Cardiff—Improving Cartwright's ginal patent chain harrow.—26th June, 1858.

WEEKLY LIST OF PATENTS SEALED.

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|---------------------------------|-----------------------------|
| <i>July 8th.</i> | 1086. S. Carpenter. |
| 44. T. Knowles & W. Ogilvie. | <i>July 12th.</i> |
| 45. I. Taylor. | 51. C. Barlow. |
| 54. E. B. Bright. | 52. G. W. Muir. |
| 56. W. Parsons. | 53. R. A. Brooman. |
| 57. C. E. Matson. | 53. J. Stenson. |
| 58. J. Varley. | 64. H. Ingle. |
| 58. W. Waller. | 67. C. Schinz. |
| 97. W. Muir. | 76. E. Hille. |
| 103. W. Conlabe. | 80. R. A. Brooman. |
| 104. P. Robertson. | 92. A. Walker and T. Wills. |
| 114. W. Clark. | 94. C. N. Nixon. |
| 121. A. Sterry. | 113. J. S. Brown. |
| 136. J. Garnett and P. Garnett. | 162. J. Elder. |
| 149. J. W. Midgley. | 209. G. Bertram & W. Maude. |
| 152. P. Busd. | 239. W. Prowa and C. E. H. |
| 158. R. Wear. | 278. E. D. Johnson. |
| 255. L. Cass. | 377. D. Harris. |
| 660. W. Chadwick. | 844. C. Hawker. |
| 956. R. Johanny. | 960. E. Derogy. |
| 978. L. Talabot. | 1078. R. Hishop, junr. |
| 998. T. Preston. | 1081. A. Wolf. |
| 1059. G. Lowry. | 1149. A. P. Price. |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID

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|------------------------|--|
| <i>July 5th.</i> | <i>July 9th.</i> |
| 1816. J. A. Bellay. | 1847. J. H. Nalder. |
| 1818. A. H. A. Durant. | 1848. T. W. G. Treacy. |
| <i>July 6th.</i> | 1841. E. D. Chantaway. |
| 1803. H. S. Bonse. | 1562. J. Caldwell and J. B. McKinnell. |
| 1812. J. Reilly. | <i>July 12th.</i> |
| 1773. E. Hall. | 1555. C. F. Bialefeld. |
| <i>July 8th.</i> | |
| 1848. J. Wilson. | |

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4103	June 28.	{ Bowman's double action Travelling Blocks, for facilitating the removal of an under tier of coals	J. Bowman	18, Shaw's Brow, Liverpool.
4104	July 7.	An Improved Washing Machine	J. Cowley	Parks, St. Giles, Oxford.
4105	" 9.	Spade or Shovel	Smith and England	Stourbridge.
4106	" 10.	Improved Cork Bottle Stopper	T. H. Ross and J. D. Sprague	64, Union-street, Southwark.

Journal of the Society of Arts.

FRIDAY, JULY 23, 1858.

NOTICE TO INSTITUTIONS.

In accordance with the resolution passed at the last Annual General Meeting of the Society, the Council will present to each Institution in Union a quarto copy of the Speeches and Addresses of H.R.H. the Prince Consort.

The Department of Science and Art have placed in the hands of the Council a number of copies of the "Introductory Addresses on the Science and Art Department and the South Kensington Museum," delivered there during the last session, and a copy of this work will also be presented to every Institution in Union.

In addition to the above, the Council have decided to present to each Institution copies of twenty-two lectures delivered before the Society of Arts, on the results of the Great Exhibition of 1851.

Institutions desiring copies of these works are requested either to apply for them at the Society's House, or to communicate to the Secretary of the Society of Arts the address of an agent in London to whom they may be sent.

SPECIAL PRIZE.

The Prize of Twenty Pounds (placed at the disposal of the Council of the Society of Arts for this purpose, by the Rev. F. Trench and J. MacGregor, Esq.) and the Society's Silver Medal, offered for a Writing Case suited for the use of soldiers, sailors, emigrants, &c., will be awarded according to the following conditions:—

1. *Weight*.—None will be received weighing above five ounces when empty.
2. *Size*.—The size in length and breadth must not exceed that necessary to hold note paper.
3. *Ink*.—The case must not contain ink in a fluid state.
4. *Durability*.—It must be made of a substance not liable to be spoiled by wet, and which will protect the contents from injury.
5. *Cheapness*.—The retail price, with guaranteed supply, must not exceed 1s. 6d.

Competitors are requested to take notice that the Council reserve to themselves the right of withholding the prize should there be no article of sufficient merit brought under their notice.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 1st of January, 1859.

EXAMINATIONS, 1858.

The following papers, set at the Society's Final Examinations, in May last, are continued from page 545.

STATICS, DYNAMICS, AND HYDROSTATICS.

THREE HOURS ALLOWED.

N.B.—In the first section of this Paper, answer only one of the questions under each number, *either A or B*; in the second section you may answer all or any of the questions.

SECTION I.

1. (A) Show how the resultant of any number of forces, acting upon a given point in the same plane, may be determined.

(B) Apply the Principles of the Composition and Resolution of Forces to explain the action of the chains of a suspension bridge.

2. (A) Give a general description of the construction and mode of using Atwood's machine.

(B) Give a Tabular Analysis of the Motion of a Falling Body, carried to five seconds of time.

3. (A) Define the term "Line of Direction," and show that a Cone will stand more firmly on its base than a Cylinder of equal dimensions.

(B) Why is it necessary to lean forward before rising from a Chair?

4. (A) Prove the equation of equilibrium in the Wheel and Axle, and the Screw.

(B) If in a Differential Screw the thread of the outer screw be $\frac{1}{4}$ inch, and that of the inner $\frac{1}{8}$ inch, the length of the lever 2 feet 6 inches, and the power applied 45 lbs., what compressing force will be exerted?

5. (A) State the general Laws of Impact and Collision; and explain the principle upon which the efficacy of the Hammer depends.

(B) Enumerate the principal Machines, and their uses, which depend upon Impact for their power.

6. (A) What is the Hydrostatic Paradox? Describe an apparatus for illustrating the nature of this principle.

(B) Show, by reference to the apparatus called the Hydrostatic Bellows, that the Hydrostatic Paradox is analogous to the principle of "Virtual Velocities" in Mechanics.

7. (A) Show by a diagram the construction of Bramah's Hydrostatic Press; and explain the mode adopted in applying its power to launch the great steam ship "Leviathan."

(B) Explain the principle of the Equality of Pressure of Fluids, and describe its application by a diagram of the Water-crane.

8. (A) A solid immersed in a fluid loses so much of its weight as is equal to the weight of the fluid it displaces; explain the method of verifying this fact experimentally.

(B) Define the meta-centre, and show its relation to the conditions of stable, unstable, and neutral equilibrium in floating bodies.

9. (A) Define the meaning of the term "Specific Gravity." What are the uses and modes of employing the Hydrometer and the Specific Gravity Bottle?

(B) Explain the mode of obtaining the Specific Gravity of a solid substance lighter than water; and apply it to determine the Specific Gravity of a light substance from the following data:—

Weight in air	50 grains.
Weight of piece of Metal in Air	388 grains.
Weight of both in Water	342.2 grains.
Weight of Metal in Water	343.8 grains.

10. (A) Describe any two of the machines which have been used for raising water independently of Atmospheric Pressure.

(B) Explain the construction and the action of the valves of the Lifting and Forcing Pumps respectively.

11. (A) Upon what circumstance does the velocity of a fluid, issuing from an aperture in a vessel, depend? If a tall vessel be pierced with holes at the depth of 1, 4, 9, 16, 25, inches, what will be the respective velocities of the issuing fluid?

(B) What is the Vena Contracta? Explain the cause of this phenomenon, and describe the arrangements by which the greatest quantity of a fluid can be discharged by an aperture of given dimensions at a given depth.

SECTION II.

1. Describe Smeaton's Pulley, and explain, by a diagram, the system of pulleys in which the equation of equilibrium is

$$P = \frac{W}{2^n}$$

2. Define and explain respectively the Centres of Oscillation, Percussion, and Gyration.

3. Explain the Law of the Descent of a Body upon an Inclined Plane; and find the Velocity of a body when it has moved through 150 feet on a perfectly smooth plane, inclined to the horizon at an angle of 30° .

4. Show that the surface of a fluid at rest is perpendicular to the resultant of all the forces which act at any point of the surface.

5. A portion of freestone weighs in air 1871.7 grains, and in water 1042.76 grains, a portion of marble weighs in air 1067.4 grains, and in water 635.37 grains; compare the densities of the two stones.

6. Water flows from a horizontal jet 10 feet from the ground, in the side of a cylindrical vessel, with a velocity of 4 feet per second; at what distance from the bottom of the vessel will the jet strike the ground?

7. What are the most effective arrangements for the Centrifugal Pump? What proportion of the power can be utilised?

8. Describe the principle and construction of Mongolfier's Hydraulic Ram.

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. What is friction? State the principal laws which regulate its action. Explain some of the means adopted to reduce the friction between an axle and its bearing in machinery.

2. Describe the Hydrostatic Press; explain the principle of its action, and show particularly the method of preventing leakage between the ram and the cylinder.

3. What are the laws which govern the motion of a pendulum? Explain the Dead-Beat Escapement in a clock.

4. What is the object of the fusee in a watch? How is a watch kept going while being wound up?

5. Distinguish between cast iron, malleable iron, and steel.

6. Describe the construction of a Cornish Boiler. What are its principal appendages?

7. Having given the strength of boiler plate per square inch of section, show how to find the thickness of a cylindrical boiler of given diameter, adapted to support a given pressure of steam.

8. Give an account of the principal parts of a condensing Beam Engine.

9. Explain the "Parallel Motion" of a Beam Engine.

10. What is meant by the "lap" and "lead" of a slide valve? In what way do they affect the working of a Steam Engine?

11. How may the Horse Power of a Steam Engine be determined?

12. Explain the advantage of working a Steam Engine expansively. What is the arrangement of Woolf's Engine?

13. Describe Mr. Whitworth's Planing Machine?

14. Give any methods of advancing the Drill in Drill-ing Machines.

ELECTRICITY AND MAGNETISM.

THREE HOURS ALLOWED.

1. What are the poles of a magnet, and what are their properties?

2. What is inclination or dip? Describe the instrument by which it is observed, and its present amount.

3. How is the compass affected by the iron of a ship? and how can this disturbance be best obviated? Is its effect constant?

4. Can magnetism be properly called an attractive force? Illustrate your answer by experiment.

5. What are the three elements of terrestrial magnetic force? How have their changes been observed and recorded.

6. How many kinds of electricity are there? By what means is their existence recognised?

7. What is the difference between an electroscopist and an electrometer? Describe Coulomb's torsion electrometer.

8. Is the contact of an electrified body necessary to the disturbance of electrical equilibrium in another body? What is this mode of action called? Describe some illustrative experiment or apparatus.

9. What are the actions respectively of a point and a knob when presented to an electrified body? Explain the theory of this.

10. What conditions are essential to the efficacy of a lightning conductor?

11. Describe Wollaston's and Smee's Batteries, and their relative advantages or disadvantages.

12. Describe some simple cases of electrolysis by a battery current, and the actions which take place in the battery.

13. By what means can electricity of high tension be obtained through the agency of a battery current.

14. Describe the magneto-electric telegraph, and state its advantages and disadvantages.

15. Describe the construction and uses of a thermoelectric pile.

HEAT.

1. Explain the nature of heat.

2. What is the principle of construction, and the mode of graduating a thermometer.

3. Describe the modes by which heat may be transmitted from one body to another.

4. Explain the principle involved in the selection of materials for clothing.

5. What is the specific heat of bodies? Illustrate your answer by experiments.

6. Under what circumstances does heat become latent? Give a conspicuous example of the amount of latent heat.

7. Show by an experiment that the reflection of light and of heat are analogous.

8. Explain the relations between surface and radiation.

9. State the phenomena of evaporation; and the construction of the cryophorus.

ASTRONOMY.

THREE HOURS ALLOWED.

1. Define the terms "Equator," "Ecliptic," "Tropics," "Polar circles," "Right Ascension," "Declination," "Meridian," "Terrestrial latitude and longitude," and "Celestial latitude and longitude."

2. Describe the Ptolemaic and Copernican systems and state your reasons for preferring one to the other.

3. Explain the length of days and seasons at different parts of the earth.

4. Describe the Transit instrument and its use.

5. Explain the principle of Hadley's sextant.

6. Explain the equation of time.
7. Describe any physical peculiarities in the Moon.
8. What is the method of finding the time by equal latitudes?
9. The Sun's meridian altitude being observed and its declination given, to find the latitude of the place of observation.
10. Describe any physical characters of the fixed stars, silky way, and nebula.
11. State the laws of Kepler.
12. Describe any methods of determining the figure of the Earth.
13. Explain the Trade Winds.
14. State the law of Gravitation and its application to motion in an orbit.
15. Explain the precession of equinoxes and its physical cause.
16. State any proofs of the rotation of the earth.
17. Describe the different aspects of the ring of Saturn as seen from the Earth, and the reason of them.
18. Explain any method of determining the distance of a planet from the Sun.
19. Give a general explanation of the Tides.
20. Explain how Venus has two summers and two winters in her year.

CHEMISTRY.

THREE HOURS ALLOWED.

No Candidate is to answer more than three questions in each Division.

FIRST DIVISION.

1. What is meant by the expression "coefficient of expansion of gases?" Give numerical instances.
2. Describe the action of heat upon water in its different states.
3. A piece of stone weighs three pounds in the air, but only two pounds when immersed in water; what is its specific gravity?
4. Describe the decomposing action of light on chemical compounds, adducing instances.
5. Describe the construction of a Daniell's cell. Explain its action, and the changes which occur during its action.
6. How are metallic objects silvered or gilt by the action of galvanism?

SECOND DIVISION.

1. How is atmospheric air best analyzed? And how are its chief constituents best prepared in a state of purity?
2. How much oxygen will be necessary for the complete combustion of a gallon of marsh gas?
3. Describe the preparation of nitric acid; also its best reactions.
4. Explain the manufacture of sulphuric acid; its uses, impurities, and reactions.
5. What are the constituents of coal gas, and how are they severally detected in that mixture.
6. By what processes can the amount of nitrogen be determined in organic bodies?

THIRD DIVISION.

1. How is metallic tin prepared? How purified? Describe its chief uses.
2. A solution containing free hydrochloric acid gives a black precipitate with sulphuretted hydrogen. What may this precipitate consist of? and how would you examine it?
3. Explain the manufacture of cast-iron, wrought-iron, and steel.
4. A mixture is given containing common phosphoric acid, sulphuric acid, magnesia, and soda, dissolved in water. How would you separate these constituents and estimate them quantitatively?
5. How much silver is contained in 100 grains of the chloride?

6. Describe the manufacture of soda-ash; name its chief impurities, and explain how their percentage is estimated?

FOURTH DIVISION.

1. Describe the preparation of acetic acid; also the composition and properties of its chief compounds.
2. 100 grains of a volatile organic body yielded in combustion
193.8. gr. carbonic acid;
81.5. gr. water;
calculate the empirical formula of the body.
3. How is the atomic weight of tartaric acid determined?
4. Describe the preparation, properties, and chief compounds of quina.
5. How is butyric acid prepared from sugar?
6. Explain the action of anhydrous sulphuric acid on olefiant gas; also the action of hydrated sulphuric acid.

ANIMAL PHYSIOLOGY.

THREE HOURS ALLOWED.

N.B.—The candidate may choose such questions from this paper as he judges he can satisfactorily answer within the time allowed; it being understood that value will be given for the fulness as well as the number of the answers, provided they are to the point.

1. Explain what is meant by a "vital property." What vital properties are recognised in the animal body, and by what phenomena do they manifest themselves?
2. Give a short account of the blood; comprehending its physical characters and chemical constitution—its corpuscles, with their differences in figure, size, and structure in different animals—the nature of the plasma, and the changes which take place in blood drawn from the vessels.
3. Point out the differences of animals and vegetables in respect of the nature of their food and mode of nutrition. Mention the chief alimentary principles contained in human food, and explain the purposes which they respectively fulfil.
4. Give a concise description of the several parts of the alimentary canal in Man, and state the chief modifications, connected with the nature of the food, which it presents in different animals. Describe more particularly the structure of the stomach in ruminating animals, and explain the process of rumination.
5. Give an outline of the structure of the chest and lungs, and explain the mechanism of breathing; state the changes which the air and blood respectively undergo in respiration, the purposes fulfilled by that function in the animal economy, and the train of consequences which follow its suppression.
6. What explanation can be given of the process of secretion? Describe the mode of construction of secreting organs in general, with the modifications of the general type in the different classes of these organs; pointing out the adaptation of structure to function, so far as it is understood.
7. Describe succinctly the structure of the human ear, and state what appear to be the most probable uses of its several parts; referring to the modifications presented by the organ in the animal series, so far as they appear to throw light on its functions.
8. Give an outline of the structure and general arrangement of the nervous system in a vertebrate animal, and compare it with that of the articulates. State briefly the functions of the nervous system.
9. State the chief points of difference between mammiferous animals and batrachian reptiles, in respect of their general economy, their principal organs and functions, and the mode of their foetal development.
10. Explain the principle of homology as manifested in the construction of the vertebrate skeleton; giving examples in illustration.

BOTANY.

THREE HOURS ALLOWED.

The Candidate is not to answer more than twelve questions, which may be selected at will from the two Sections.

SECTION I. (for Competency.)

1. Enumerate the organs found on a perfect flowering plant.
2. Describe the most important kinds of venation of leaves.
3. Name the principal forms of inflorescence.
4. Explain the difference of structure between a double Rose and a double Dahlia.
5. Name and give examples of the different relations in which the calyx and ovary stand in flowering plants.
6. What differences do we find in the structure of the seeds of the Oat, Bean, and Linseed?
7. By what characters can you distinguish Hemlock (*conium maculatum*) from any other native plant?
8. Give a short character of the order Cruciferae.
9. Give a short character of the order Leguminosae.
10. How do you know Malvaceae from any other native plants?
11. Refer the following plants to their respective natural orders:—Strawberry, Sweet-pea, Fuchsia, Monkshood, Tulip, Crocus, China Aster, Thyme, and Celery.
12. State what you know of the functions of the different organs of flowering plants.

SECTION II. (for Proficiency or Excellence.)

1. Explain the morphological connection of the organs of flowering plants.
2. State the general rules upon which the classification of the forms of leaves is founded.
3. Explain the relations of the different forms of the indefinite type of inflorescence.
4. Give an outline of the general principles of the morphology of flowers.
5. Describe and explain the various conditions of the calyx and ovary in the Rosaceae, (including the Pomaeae and Amygdaleae.)
6. Describe minutely the ovule and ripe seed of any plant with which you are acquainted.
7. Mention and give the essential characters of the poisonous Solanaceae found wild in Britain.
8. Name an order which has the following character:—sepals, petals, and stamens 4—8 or 5—10, corolla monopetalous, stamens hypogynous, anthers opening by pores, ovary superior, many-celled, many-seeded.
9. Name an order which has sepals and petals four or five, stamens indefinite, inserted on the calyx. ovaries composed of more or less distinct carpels more or less superior or inferior.
10. State the differences between Linaceae, Malvaceae, and Geraniaceae.
11. Name the native plants cultivated for food belonging to the orders:—Cruciferae, Umbelliferae, Rosaceae, Compositae and Liliaceae.
12. Give a brief outline of the principal chemical and physiological phenomena occurring in the growth of ordinary green plants.

AGRICULTURE.

[No paper was set in this subject, as no candidates appeared in it this year.]

POLITICAL AND SOCIAL ECONOMY.

THREE HOURS ALLOWED.

Each of the four following questions should be answered.

1. Show the way in which the division of labour increases the productive powers of man.
2. What is fixed Capital? and what is circulating Capital? and of what does each consist?

3. Define Rent, Interest, and Profit.
4. Describe a Bill of Exchange and its origin.

The four following are optional Questions.

1. Does Rent enter into the price of Commodities?
2. In what way does a Bill of Exchange differ from money?
3. In what way does an increase of money affect prices?
4. What are the advantages and disadvantages, with respect to the production and preservation of wealth, of the system which gives to the oldest son of a family the whole of its Landed Property?

DESCRIPTIVE GEOGRAPHY.

THREE HOURS ALLOWED.

The Candidate is only allowed to answer one half of the total number of questions in each Section.

SECTION I.

1. Name the county in which each of the following towns is situated:—Huddersfield, Axminster, Maidstone, Wells, Merthyr Tydvil, Grantham, Kidderminster, Stoke-upon-Trent, Wrexham, Lewes, Penzance, Aberystwith, Rochdale, Stockport, Paisley, Glasgow, Leith, Dundalk, Belfast, and Coleraine.
2. Enumerate the principal seaports that would be successively passed in making the circuit of the Mediterranean coasts, beginning at the Strait of Gibraltar. Mention the country to which each belongs.
3. Draw up a table of the political divisions of Italy, giving the capital, and the principal seaports, of each.
4. What is meant by the "overland" route to India? State the general course which a person going from England to India by this route would take, and name the places that constitute the chief stations on the journey.
4. Name, in geographical succession, the principal towns passed in ascending the stream of the Ganges, from the Bay of Bengal to the Himalaya mountains.
6. Draw up a list of the British Colonies and Dependencies in North America (exclusive of the West Indies), and give the principal towns of each.
7. Name eight among the largest cities of the United States, giving the position (whether on any river, or otherwise) of each, and the State in which it is situated.
8. From what countries does Britain derive her chief supply of the following articles:—Cotton, indigo, coffee, sugar, wool (sheep's), tallow, and hides?
9. On what rivers are the following towns situated:—Turin, Prague, St. Petersburg, Stettin, Belgrade, Leningrad, Delhi, Cawnpore, Ava, Cincinnati, New Orleans, and Melbourne?
10. Where are the following seaports:—La Guayra, Callao, Kurrachee, Beyrout, Point de Galle, Akyah, Valparaiso, Charleston, Mobile, Quillimane, Bahia, D'Urban, Maulmein, and Tranquebar?
11. Name the colonial possessions and foreign dependencies of any one of the following States:—

- (a) France.
- (b) Holland.
- (c) Denmark.

12. Draw a map to show the situation (with reference to adjacent geographical features) of any one of the following cities:—St. Petersburg, Vienna, Lisbon, or Constantinople.

SECTION II.

13. Draw a map of any one of the undermentioned countries,—marking on it the chief mountain-ranges, plains, and rivers, with the positions of the principal seaports:—

- (a) France.
- (b) Italy.
- (c) China.

14. Draw a map of your own country, marking on it

the prominent features of surface, the river, and the sites of the principal towns.

15. Draw up a table of the political divisions of Europe, arranging the various countries under the head of empires, kingdoms, grand-duchies, &c., and naming the capital of each.

16. What territories are comprehended under the appellation of British India? Draw up, as well as you are able, a table of the different countries or provinces which it embraces, with the principal towns in each.

17. Enumerate the possessions of Britain upon the West Coast of Africa, to the northward of the equator, mentioning their characteristic articles of native produce, and the names of the chief seats of trade.

18. What constitute the principal commercial productions of the East Indian Archipelago, and between what nations is the traffic in them chiefly maintained.

19. In what parts of Great Britain and Ireland are the manufacture of textile fabrics (cotton, woollen, linen, and silk), and of hardware goods, chiefly carried on? (Specify the localities according to counties, and name the towns which are the more special seats of each manufacture.)

20. Draw up a table of the States and Territories that are comprised within the North American Union (United States), arranging them according to their position along the Atlantic coast—within the Valley of the Mississippi, or beyond the Rocky Mountains.

21. Enumerate, in the order of their respective settlement (according to priority of date), the Australian Colonies of Britain, with the chief towns of each.

22. Taking the total population of the globe at a thousand millions, of what amounts are respectively (in round numbers) the inhabitants of Europe, Asia, Africa, and America? In which of these divisions is the population, relatively to extent of surface, most dense?

23. Give a brief account of any one of the under-mentioned British Dependencies, with reference to geographical position and features, commercial importance, and circumstances of acquirement by Britain:

- (a) Gibraltar.
- (b) Malta.
- (c) Hong-Kong.

24. Indicate, by reference to modern localities to which their remains are proximate, the situation of the following cities of antiquity:—Nineveh, Babylon, Thebes, Memphis, Carthage, and Petra.

PHYSICAL GEOGRAPHY, INCLUDING GEOLOGY.

THREE HOURS ALLOWED.

Candidates are not to answer more than twelve questions in this paper.

SECTION I.

1. Give a brief account of the chief physical features of the county in which you live.

2. Name the chief headlands, inlets, and mouths of rivers, of one of the following coast-lines:—

- (a) From the mouth of the Ouse to that of the Stour.
- (b) From St. Bee's head to Hartland Point.
- (c) From Malaga to Leghorn.

3. Describe the course of one of the following rivers from its source to its mouth, noticing the principal tributaries, the nature of the country drained by it, and any other particulars of importance:—

- (a) The Trent.
- (b) The Ganges.
- (c) The Po.
- (d) The Orinoco.

4. Write a short account of the Physical Geography of one of the following countries:—

- (a) France.
- (b) Spain.
- (c) Egypt.
- (d) New Zealand.

5. Under what heads may lakes be classified? Briefly describe any two of the following—(a) Lake Baikal; (b) the Dead Sea; (c) the Lake of Titicaca; (d) the Lake of Constance; (e) Windermere; (f) Loch Fyne.

6. Define a line of watershed. Describe as nearly as you can the line which separates the Eastern drainage of England from the Western.

SECTION II.

7. Describe the principal currents of one of the oceans. To what great causes are the ocean currents attributed.

8. What is an Isothermal line? What are the causes which prevent the Isothermal lines from coinciding with the parallels of latitude on the surface of the globe?

9. Give some account of the Monsoons. What appears to be the cause of them?

10. What is meant by a map of cotidal lines? To what use may such a map be applied?

11. Name the chief ranges of mountains and hills in Great Britain, and state the predominating geological character of each.

12. From what geological formations, and from what counties, do we obtain our chief supply of the following substances:—gypsum, tin, zinc, copper, common salt?

13. What is the probable origin of coal? What are the evidences of this origin? Name the chief varieties of coal. To what special uses is each variety applied?

14. Name, or exhibit in a map, the chief coal-fields of England and Wales, distinguishing those that are most important, and those which produce most iron. Which of the British Colonies produce coal?

15. Into what great geological regions may Scotland be divided? Can you connect this division with the different pursuits and characters of the inhabitants?

16. Give some account of the most remarkable extinct saurian animals, mentioning the formations in which their remains are found.

17. Explain the difference between valleys of elevation and valleys of denudation.

18. Describe, or show by a map, which are the great volcanic regions of the globe. What are the chief mineral products of volcanic districts?

19. Write an account of, or illustrate by a map, either (a) the distribution of the most valuable domesticated animals, (b) that of the most important kinds of grain, or (c) that of the most useful fruits.

20. Give a short description of the varieties of the human race and of their geographical distribution.

ENGLISH HISTORY.

THREE HOURS ALLOWED.

You are to answer the whole, or as many as you can, of the eight following questions.

1. Whom did Edward the Confessor succeed on the throne of England? Who were the claimants to the throne after the death of Edward the Confessor? How, when, and where did each of those claimants die?

2. Give a short account of Wat Tyler's insurrection.

3. Write down the names of our principal Statesmen, and Military and Naval Commanders during the reign of Queen Elizabeth.

4. Mention the names of the Sovereigns of the House of Stuart who have reigned in England; and give, as nearly as you can, the dates when the reign of each commenced, and when it ended.

5. When was the Bill of Rights passed? What does it enact about Standing Armies?

6. Mention the names of the most eminent English writers who flourished during the reign of Queen Anne.

7. What Countries and places, beyond the British Islands, were parts of the Dominions of George the Third, at the time of his Accession?

8. In what reign, and against what enemy was each of the following battles fought?

Agincourt,	Crecy,	La Hogue,
Bannockburn,	Dettingen,	Plassy,
Blenheim,	Floiden,	Quebec,
Bovines,	Fontenoy,	Wandewash.

You are to answer any four, or as nearly four as you can, of the following eight questions.

You are to select those which you think yourself best able to answer fully.

No marks will be obtained by answering more than four.

1. State and explain the chief Articles of the Treaty of Utrecht; and give a brief account of the English Ministers by whom it was concluded.

2. State and explain the chief provisions of the Act of Settlement; and give a brief account of the origin and functions of the Privy Council.

3. What is meant by a Writ of Habeas Corpus? Cite the words of the Great Charter which affirm the principle on which it is founded. How was its operation secured and extended by the Habeas Corpus Act, in the reign of Charles II.? Cite instances of the suspension by Parliament of the Habeas Corpus Act.

4. Describe the origin and growth of our Hereditary Peerage, comparing it with the Noblesse of France; and give a brief account of the attempt made in the reign of George I. to limit the Royal Prerogative of creating Peers.

5. Quote the words of the Great Charter which affirm the principle of Trial by Jury. In what respect did the functions of the ancient Juries differ from those of modern Juries? Give a brief account of the arguments and judgment in Bushel's case, in the reign of Charles II., as to the legality of fining Jurymen for a perverse verdict.

6. What are the chief distinctions between a Parliamentary Impeachment and a Bill of Attainder? Give a brief account of the proceedings against Lord Strafford, Sir John Fenwick, Lord Somers, and Lord Oxford.

7. Trace in the Great Charter of John, and in the Statute of Edward I. entitled "Confirmatio Cartarum," the early indications of the principle that Taxation without Parliamentary consent is illegal. Show how this principle was affirmed and extended by the Petition of Right. Show how the mode in which the Appropriation Acts have been passed since 1688 has increased the control of the House of Commons over the executive power.

8. What were the conflicting claims of the American Colonists, and of the Crown, which led to the American War? State the general distinctions between the Constitutional rights of British subjects, who form a Colony in a Country previously uninhabited by a civilised race, and the rights of those who settle in a Dependency which the Crown has acquired by conquest or cession from other Powers.

(To be continued.)

UNIVERSAL CURRENCY.

A plan for a universal currency has been published in a pamphlet, by Mr. T. A. Tefft, who is at present in this country, prosecuting inquiries as State Commissioner of Industrial Art Education for Rhode Island, United States. Mr. Tefft's plan is to bring the French, the American, and our own currency into accord with each other, and this he considers, for all practical purposes, solves the question of a universal currency. In his pamphlet he addresses himself to the answering the following questions:—

"What unit is best suited to an universal currency?"

"What shall be the coins above, and the divisions below, the unit?"

"What shall be the standard weight and fineness?"

He says:—"In seeking for a unit as a basis of this general system, it is important to select one that already exists in a large and increasing currency, if such an one can be found to answer the purposes best, and render the recoinage necessary on about the same conditions in each of the three countries. It is also desirable to select a medium unit between the extremes which exist, if this is practicable.

"The unit of the dollar will be found to answer these conditions.

"It already exists in a coinage of five hundred millions, is of ancient origin, is best known in the different quarters of the globe, has its counterpart in the Italian and Spanish currencies, and it is the intermediate unit between the franc and the pound.

"I propose, then, the dollar as the universal unit.

"Its value to be exactly the same as five francs of the French, or four shillings of the English currency, under the new system. This unit of the currency, the dollar, to exist only in the gold coin; no silver coinage allowed in pieces larger than fifty cents, or half-a-dollar.

"The pieces of coinage to be—

In Gold.....	1 dollar, or the unit.
	2½ dollars.
	5 " the present sovereign.
	10 " the new sovereign, the Napoleon or eagle.
In Silver ...	50 cents.
	25 " the English shilling.
	(20 " the franc, for France only.)
	10 "
	5 "
In Copper...	2 " the English penny.
	1 cent, the French sou.
	½ " or 5 mills.
	(¼ " or 2½ " for England.)
	(⅓ " or 2 " for France.)

"For the standard in weight, I propose the French coinage—the only coinage based on a decimal weight, with a very slight change—in order to have the dollar, 14 grammes, a simple quantity, instead of the present fractional weight of five francs in gold, 1-6129; and the weight of the dollar in silver, 22-5 instead of 25 grammes, the present weight of five francs. Then the ratio between the two metals would be 14-0625. This would scarcely disturb the gold standard in France and England, and merely raise the value of silver in France to its corresponding value to gold in England and America.

"All gold and silver coinage to be nine-tenths fine.

"The copper coin—the coin of greatest token value—to be of the same mixture as now used in France, viz. 95 copper, 4 tin, 1 zinc, and the same weight.

"This mixed copper coin would then have, for the same value, only about half the weight of the copper coin now used in England and America.

"The national pieces of gold coin, the Napoleon, the sovereign, and the eagle, should each be 10 dollars, the largest piece of coinage. This would simply require the name sovereign to be applied to double its present value, and the application of the name Napoleon to 50 instead of 20 francs, as at present, the application of these names being purely conventional. These pieces should have the national arms, in place of the numerical value stamped upon all the other coins, opposite the medallist side, thus giving to the largest pieces of coinage the greatest nationality, and occasion for the highest artistic treatment.

"In silver, the English shilling would be 25 cents, and the florin would be 50 cents, the largest silver piece in the new currency. In France, the five-franc and two-franc pieces would be dispensed with, and the half-dollar employed in their stead. The franc would be retained, from its long-established name and associations, as 20 cents, instead of dividing the half-dollar into quarters, as in England and America.

"In copper coin, the two-cent piece, the same as the ten-centime piece now used in France, would be the penny in England; and the cent, or centime, as it would be called in France, would be equal to five centimes of the present French money, or nearly the halfpenny in England. The half-cent would represent the farthing, and the quarter-cent, or $2\frac{1}{2}$ mil-piece, would be required to make the exact change for sixpence and threepence of the present English money; while the one-fifth cent, or 2 mils, would be precisely the same as the present centime in France.

"In this re-stamping of money, the French coins now issued should be regarded as the models of taste and excellence.

"Under this plan, then, the proposed coinage would have in each country the same unit, the same weight, the same fineness, and the same decimal divisions, thus: 10 mils = 1 cent, 100 cents = 1 dollar; 10 dollars being 1 sovereign, Napoleon, or eagle.

"In this manner, the national types of coins, the shilling and the franc, which usually take a strong hold on the people, and the names partaking of individuality and pride, the Napoleon, the Sovereign, and the Eagle, would be retained; and it is fair to suppose, that the intermediate and the ancient unit of the dollar would be recognised as more convenient than the unit of any other currency.

"In the following tables may be seen the present currencies of France, England, and America, with their fineness and weights, and the proposed universal currency. Also, a comparison between the standard weights of the principal coins, as they now are, and as proposed in the universal currency.

PRESENT CURRENCY.

FRANCE.

The unit, 1 franc (100 centimes).

Gold, % fine.	Coins.	Weight in Grammes.		Troy Grains.
		5 francs	10 francs	
Silver, % fine.	10	5.1239	10.2478	24.8914
	20	3.2258	6.4516	
	50	2.5		
Copper, % fine.	10	2.5		385.85
	20	1.25		192.925
	50	0.625		96.4625
Copper, % fine.	10	1.25		192.925
	20	0.625		96.4625
	50	0.3125		48.23125

GREAT BRITAIN.

Gold, % fine.	Coins.	Weight in Grammes.		Troy Grains.
		10 shillings	20 shillings	
Silver, % fine.	20	123.274	246.548	616.372
	40	61.637	123.274	308.186
	100	30.8185	61.637	154.093
Silver, % fine.	5	385.85	771.7	1929.25
	25	192.925	385.85	964.625
	10	77.17	154.34	385.85
Copper, % fine.	1	1.25	2.5	3.125
	2	2.5	5	6.25
	5	6.25	12.5	15.625

UNITED STATES.

Gold, % fine.	Coins.	Weight in Grammes.		Troy Grains.
		1 dollar	2 dollars	
Silver, % fine.	50	25.8	51.6	64.5
	25	12.9	25.8	32.25
	10	5.16	10.32	12.9
Copper, % fine.	1	2.5	5	3.125
	2	5	10	6.25
	5	12.5	25	15.625

PROPOSED UNIVERSAL CURRENCY.

The unit, 1 dollar (100 cents).

Gold, % fine.	Coins.	Weight in Grammes.		Troy Grains.
		1 dollar	2 dollars	
Silver, % fine.	50	25.8	51.6	64.5
	25	12.9	25.8	32.25
	10	5.16	10.32	12.9
Copper, % fine.	1	2.5	5	3.125
	2	5	10	6.25
	5	12.5	25	15.625

Comparison between the Standard Weight of Coins as they now are, and the Proposed Universal Currency.

5 francs (1/20) ...	Present Weight in Troy Grains.	Proposed Weight in Troy Grains.	Grammes.
4 shillings (1/4) ...	24.8914	24.8914	1.6
diff. in fineness ...	25.1114		
1 dollar (1/10) ...	26.8	26.8	1.6
2 1/2 francs (1/8) ...	192.929	192.929	11.25
4 shillings (1/4) ...	179.393	179.393	
diff. in fineness ...	192		
1 dollar (1/10) ...	192	192	11.25
1 sou, or 5 centimes ...	77.17	77.17	5.0
1 penny ...	144.833	144.833	
1 cent ...	168	168	

* The new five-dollar piece ... 123.472 grains troy.
Present sovereign ... 123.274 "

"I am perfectly aware that the plan I have here proposed for attaining an universal currency is novel and bold; but I feel quite confident that some plan like this must be employed to accomplish this much desired result.

"Here are three great countries, with their established currencies interwoven with all their pleasure and business habits; each country has its prestige and its pride; and, notwithstanding the advantages to be derived from a common currency may be well understood and acknowledged, yet, it is not at all probable that any two of these countries would adopt the entire system of the third. The French are satisfied with their system; the Americans with theirs; and the English, unless some arrangement like the above succeeds, are likely to have a third decimal system, with the pound sterling for the unit. This has been recommended by the last parliamentary committee appointed to report on the subject; and any one at all familiar with the English character would expect no other result. In no nation of the world is there more reason for pride and love of country than in Great Britain. To entirely change the currency in such a country would be impossible. The most that could be expected, would be the adoption of a more convenient unit, with decimal divisions and decimal weight, employing at the same time its most familiar type of coin," the shilling.

The silver coinage would have to be adjusted for the change of standard fineness. A gold standard is to be adjusted by the three nations, and silver is to be "no longer a legal tender for more than ten dollars in amount." To carry out the system Mr. Tefft says:—

"Let a commission be appointed by the British Parliament, one by the French Emperor, and one by the American Congress, to meet in convention at Brussels, during the coming year, in order to determine upon some plan like the above; and the first practical step will have been taken. Such a convention, if composed of judicious men, would undoubtedly determine upon a mode of introducing the universal currency, that would meet with general approval, and, by means of international treaty be adopted by the different governments."

RAILWAY ACCIDENTS IN FRANCE AND ENGLAND.

The following has been received from the editor of the *Mechanics' Magazine* :—

"From an interesting article which recently appeared in the Paris *La Patrie*, setting forth many important facts respecting accidents on the French railways,—which are, of course, more immediately under the control of the State than the English,—we learn that a commission has presented to the Emperor a volume entitled 'Enquête sur les moyens d'assurer la régularité et la sûreté de l'exploitation sur les chemins de fer,' containing the results of examinations of officials from the railways du Nord, de l'Est, de Paris à Lyon, de Saint Germain, de Paris à Rouen, au Havre et à Dieppe, de l'Ouest, du Grand Central, and de Sceaux et Orléans. The volume is but preliminary, and is to be followed by others giving still more extensive results. The following facts are derived from it :

"Between the 7th September, 1835, and the 31st December, 1856, the number of railway passengers in France was 224,346,769. Of this number 1,979 were injured, and 999 killed—in all, 2,978. It is worthy of remark that of these accidents 1,134 only—334 killed and 800 wounded—arose from defects in the working of the railways; while 1,844—665 killed, and 1,179 wounded—resulted from individual imprudences which were not attributable in any degree to the railway companies. Taking away the agents and servants of the companies, the number of passengers killed by the working of the trains is but 111, that is 1 in 2,021,133; and of passengers wounded, 402—1 in 568,074.

"These facts speak much in favour of the working of railways in France, and present new inducements for us in this country to give the railway system at home more serious attention than has yet been bestowed upon it. We mention this, because it is becoming more and more apparent to us that the mitigation and prevention of accidents upon railways are left too exclusively in the hands of railway companies, and require a new form of public opinion to be brought to bear upon them. It is true that this subject is frequently brought before our professional institutions, such as the Institution of Civil Engineers, the Institution of Mechanical Engineers, &c.; but many of the members of these institutions have so direct an interest in the preservation of the existing railway systems, or in the furtherance of special schemes of improvement, that the matter does not, we think, there meet with the full and unprejudiced discussion which it deserves. For this reason we think it desirable that some more independent society, such as the Society of Arts, for example, should give its attention to it; and, although it might fail to deal fully with all the technical points of difference which might arise, it could certainly collect such facts and opinions as would speedily bear fruit in increased safety of railway transit."

SOUTH KENSINGTON MUSEUM.

During the week ending 17th July, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,201; on Monday and Tuesday (free evenings), 4,895. On the three Students' days (admission to the public 6d.), 702; one Students' evening, Wednesday, 157. Total, 9,955.

Home Correspondence.

LONDON MECHANICS' INSTITUTION.

SIR,—The Committee of the London Mechanics' Institution have published a communication which assumes

the assumption that they are subjected to a very unfair competition with regard to other Institutions.

The high class and cheap instruction of Government Institutions, and the necessity for well-paid professors to make the instruction in Mechanics' Institutions efficient, is quite a delusion. The only Government Institutions to which these remarks can possibly apply, are the South Kensington Museum and the School of Mines. At South Kensington a man may possibly learn much more with his eyes than he could with his ears at Southampton-buildings, but the teaching of a well-arranged museum is not what is generally understood by the class instruction of a Mechanics' Institution, nor is there any fair comparison when one is shown against the other. The teaching by objects in a museum is a mere expansion of a Pestalozzian lesson; it is a kind of teaching best adapted to the educational condition of the people. The masses have not yet risen above material forms, and if you interest them at all, it is by things, and not words.

But look at the cheap lectures at South Kensington and Jermyn-street by well-paid professors; how is the London Mechanics' Institution to compete against them? Crosby Hall, the Working Man's College, the Evening Classes at the Polytechnic, the Mechanics' Institutions of Huddersfield and Leeds, have competed successfully against Government Institutions. The results of the last examination will show what Mechanics' Institutions can do, if they have only the spirit and will to do it.

I cannot speak positively on this subject, but I should think the evening lectures at Kensington and Jermyn-street were never intended to supply the regular systematic teaching of a well-arranged class. Who ever heard of a man becoming a physicist by attending six lectures at Jermyn-street, or a comparative anatomist by attending one lecture of Professor Owen's at South Kensington. It is scarcely fair to draw any comparison between the advantages which the graduates of the London University or the matriculated students of Jermyn-street, enjoy over those who usually attend the classes of a Mechanics' Institution. The students in the one case are studying for a distinct and specific object; in the other it is to improve and remedy in some degree the defects of a neglected education. The subjects usually taught in a Mechanics' Institution are elementary; the subjects taught at Jermyn-street are technical. Too much stress is laid upon lectures. A man may attend lectures till he grows deaf and stupid. Lectures and examinations are but the instruments of education. The work, if it is to be done, must be done by the unwearied diligence and determined spirit of the student. Lectures are a valuable means of education: they indicate the road that has to be travelled, soften difficulties, and prevent useless and desultory reading. But to suppose well-paid professors are best suited for the work is against all my experience. Oxford and Cambridge men rarely succeed as good teachers of the working class. Depend upon it the best educators are the best men taken from the class they have to educate. A good elementary schoolmaster, who understands his subject, is the best man for Mechanics' Institutions. If committees fall into the notion that well-paid professors are necessary for these classes, then there is an end to all class teaching in Mechanics' Institutions. My experience is rather against the opinion that these classes can be made self-supporting. A low fee for attendance, the expense of apparatus and rent, would leave but a small sum for the teacher. Some pecuniary aid on tested results would, perhaps, be the easiest and best method of assistance.

I should regret the failure of an Institution which has done much good. For years this Institution did its work well; and I have found in almost every part of the country men who have attributed their success in life to the lectures and class instruction of the London Mechanics' Institution. I am, &c., C. E.

Proceedings of Institutions.

KINGSTON.—The last report of the Mechanics' Institute states that its success has much exceeded that of any former year, and has far surpassed the expectations of its most sanguine supporters and friends. The Institute was established in October, 1852, its design being the rational entertainment of the members and the more general diffusion of useful knowledge by means of lectures and discussions on subjects of general interest; the establishment of a library and reading room and classes for mutual instruction amongst the members. Since the first formation of the Institute, a library of one thousand volumes has been collected. During the past year upwards of six hundred volumes have been added, an entire re-arrangement has been made, and a catalogue printed. At a Special General Meeting of the members, held on 30th December last, it was resolved, "That a donation of five pounds should entitle the donor to a life membership of the Institute."—The balance sheet shows that during the past year the donations of life members have added fifty pounds to the income. The county magistrates have kindly granted the grand jury room to be used by the members of the Institute, as a reading room, from 6 till 10 o'clock in the evening, daily (Sundays excepted). A drawing class has been conducted by three members of the committee, which, with the other classes for instruction, will be again opened during the ensuing session. The committee thank Messrs. Hayes, Reah, and Scrimgeour, for their exertions and attention to the drawing class. The president and Dr. Ellis, (a vice-president), kindly consented to represent the Institute at a local board of examiners formed by representatives from the Kingston, Richmond, and Brentford Institutes, for the purpose of examining candidates for the prizes and certificates offered by the Society of Arts. During the past session the following lectures have been delivered:—J. M. Clabon, Esq., "More Worlds than One," (two lectures); Ditto, "An Evening with the English Poets;" Professor Griffiths, "Experimental Chemistry;" A. J. Johnston, Esq., "Self-Educated Men;" W. Duncan, Esq., "Rambles on the Rhine;" Colman Burroughs, Esq., "English Journals and Journalism;" Mr. John Collings, "India" (three lectures); Mr. Hogg, "British Workman;" Mr. Strachan, "Artificial Light;" Mr. Fairbairn, "A night w' Burns." There have also been soirées, comprising musical entertainments by the members, and a concert. The lectures (with one exception) were delivered gratuitously, and the attendance of members and friends was uniformly large. The committee gave free admission to a large number of working men who were not members of the Institute, which act of liberality has been much appreciated. The present state of the funds is very encouraging. The receipts by subscriptions and donations, and for admission to lectures, for the year ending the 24th June, 1858, amount to £168 17s. 11d.; the expenditure for the same time being only £82 14s. 1d., leaving a balance of £86 3s. 10d. in favour of the operations of the Institute for the past year. This balance has been applied towards the liquidation of a debt of £135 11s. 9d., due by the Institute, which had accrued from time to time during the period from 1852 to 1857. The committee take great encouragement from the much improved state of the library, and steady increase of the funds, arising from the yearly subscriptions of the members themselves. They rejoice to find that the number of 115 members at the commencement of the year, has been increased to 272. The committee desire to tender, in the name of the members, their warmest thanks to J. M. Clabon, Esq., the president, for his continued and unwearied interest in the prosperity of the Institute; to His Royal Highness the Duke of Cambridge, and the noblemen and gentlemen who have become patrons and

vice-presidents; to the friends who have delivered lectures, and to those who have kindly contributed to increase the library by their gifts of many valuable books, and to all the elected officers for the efficient discharge of their honorary duties, during the season now closed.

LOCKWOOD.—Through the kind permission of J. W. Croaland, Esq., the members and friends of the Mechanics' Institution held a *gala* in the park of Thornton Lodge on Saturday, the 10th inst. There were about 1,000 persons present. Among others were J. W. Croaland, Esq., and Mrs. J. W. Croaland, T. P. Croaland, Esq., J.P., Rev. T. B. Benster, M.A., Bentley Shaw, Esq., J.P., President of the Institution, and Mrs. Bentley Shaw. All present seemed to enjoy themselves, and it is satisfactory to be able to report that so much pleasure was not unattended with some degree of pecuniary profit to the Institution.

NAILSWORTH.—The Members of the Literary and Mechanics' Institute made an excursion to Tortworth Court, the seat of Earl Ducie, on Tuesday, the 13th instant. The number present amounted to upwards of 170. Several spring waggons were lent for the occasion by Mr. W. Holmes, and they were horsed by Mr. Brooks and Mr. Clissold. Lord Ducie having kindly granted the use of his park, the party, after dining under the trees, amused themselves by visiting various parts of the grounds, rowing on the lake, playing quoits, cricket, &c.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 14th July, 1858.

412. Destitution (Gweedore and Cloughnaboley)—Report from Committee.
343. Oxford University—Report of the Commissioners.
403. Metropolis Drainage—Return.
185. Bills—Leasing Powers (Ireland).
194. — Law of False Pretences Amendment.
195. — County Court Districts.
196. — Church Rates Commutation.
197. — Sheep, &c., Contagious Diseases Prevention.
198. — Ecclesiastical Jurisdiction Continuance.
199. — Charitable Trusts Acts Continuance.
200. — Turnpike Trusts Arrangements.
201. — Copyhold and Inclosure Commissions, &c.
202. — Indemnity.
203. — Sale of Poisons, &c.
204. — Cornwall Submarine Mines.
205. — Ecclesiastical Commission.
206. — Army Service.
207. — Inclosure of Lands.
208. — Markets and Fairs (Ireland) (as amended by the Select Committee).
- Poor Law Board—10th Annual Report.
Delivered on 15th July, 1858.
162. Estimates for Civil Services—General Abstract.
- 162 (7) (1). General Board of Health—Estimate.
411. Railway and Canal Legislation—Report from Committee.
426. Army (Barracks)—Supplementary Estimate.
427. Army (Survey of the United Kingdom, &c.)—Supplementary Estimate.
428. Militia Estimates—Report.
379. British Museum—Return.
209. Bills—County, &c., Property Conveyances (amended).
210. — Jews.
211. — Oaths—Lords' Reasons for insisting on their Amendments.
212. — Returns to Secretary of State.
213. — Turnpike Acts Continuance.
Delivered on 16th July, 1858.
369. War Department—Copies of Correspondence (a corrected Copy).
390. British Museum—Returns.
410. Slave Trade (Cuba)—Return.
423. Militia (Volunteers)—Return.
- Fisheries (Ireland)—Report of the Commissioners.
Delivered on 17th and 19th July, 1858.
301. East India (Sunday Trains)—Copy of Correspondence.
395. Poor Law (District Schools)—Return.
396. Poor Relief (Wick)—Return.
105. Chamber of London—Annual Accounts.
406. East India (Alumbagh)—Return.
409. Constabulary and Revenue Police (Ireland)—Return.
417. Foreign Office Re-construction—Report.
418. Contracts (Public Departments)—4th Report.
421. Friendly Societies (Scotland)—Report by the Registrar.
423. Iron Ordnance Factory (Woolwich)—Returns.

422. Stevens' Regulating Air Doors—Copy of Report.
 251. Finance Accounts—Classes 1 to 8.
 215. Bills—Wine, &c.—Ireland.
 216. —Metropolis Local Management Act Amendment.
 216. —New Writs (amended).
 217. —Evidence on Oath (Private Bill Committees).
 218. —Corrupt Practices Prevention Act Continuance (amended).
 220. —Universities and College Estates (Lords Amendments).
 221. —Incumbered Estates (West India) Act Amendment.
 222. —Marriages (Moscow, Tahiti, and Ningpo).
Delivered on 20th July, 1858.
 381. Bank Acts—Report from Committee.
 426. Army in the East—Dr. Mapleton's Report.
 430. Appropriation Bill—Copy of Correspondence.
 440. Carliase Diocese—Returns.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, July 16, 1858.]

- Dated 29th May, 1858.*
 1218. J. Schloss, 75, Cannon-street West, City—A so-called book clasp, or improved fastening of books, being also applicable to pocket-books, ledgers, blotting cases, and similar articles where locks, bolts, or clasps are employed.
Dated 30th June, 1858.
 1290. W. Clark, 53, Chancery-lane—The manufacture or preparation of extract of Peruvian guano. (A com.)
Dated 10th June, 1858.
 1399. W. Davis, Loveday-street, Birmingham—Certain imp. in the tangs of awls, also in the mode of manufacturing awl-blades, or similar articles, and likewise in the stocks or pads for holding the same.
Dated 19th June, 1858.
 1338. W. Clark, 53, Chancery-lane—A new treatment or preparation of a vegetable product, and its application as a fibrous or textile material. (A com.)
Dated 18th June, 1858.
 1377. W. Blizard, 14, Victoria-terrace, Ladbrooke-road, Nottingham—Imp. in india-rubber, gutta percha, and drying and other oils.
Dated 24th June, 1858.
 1425. P. Griffiths, Manchester-road, Burnley, Lancashire—Imp. in the manufacture of shaft couplings.
 1427. J. Robinson, East India-road—Imp. in applying and adapting water-closets to ships, so as to ensure the safety and more perfect ventilation of the same.
 1429. J. H. Johnson, 47, Lincoln's Inn-fields—Imp. in machinery or apparatus for making bolts and rivets. (A com.)
 1430. B. Pickering, Lookerbie, Dumfries, N.B.—Imp. in apparatus for communicating signals from one part of a railway train to another.
Dated 25th June, 1858.
 1433. C. Nightingale, Wardour-street, Soho—Imp. in apparatus applicable to curling and spinning machines for horse-hair and other materials.
 1435. R. Smith, 45, Essex-street, Strand—Imp. in fire-arms and ordnance, and in the projectile to be used therewith.
 1437. J. Westwood, London-yard, Isle of Dogs, Poplar—Imp. in the plating of ships and hoisting and other batteries, to render the same shotproof.
Dated 26th June, 1858.
 1439. P. M. Crane, Irish Peat Company's Works, Athy, Ireland—Imp. in the manufacture of fuel from peat.
 1441. W. L. Tizard, Mark-lane—An improved method of treating brewers' and distillers' malt or grist.
 1443. W. Woods, Gloucester—Imp. in implements for paring, hoeing out, and clearing land, and for depositing seed.
 1445. T. V. Flinn, Edward's-place, Doyneford-road, Camberwell-green—Imp. in sash-bars, for the purpose of drainage.
 1447. E. Pincheon and W. R. Harris, Elbeuf, France—Imp. in machinery for manufacturing heads or harness used in looms for weaving.
 1449. W. H. Preece, 7, Bernard-street, Primrose-hill, and J. L. Clark, Adelaide-road, Haverstock-hill—Imp. in electric telegraphs.
Dated 28th June, 1858.
 1451. I. Hammond, Winchester—Drawing the cartridge case from the barrel of a breech-loading gun.
 1453. J. Lull, 13, Welbeck street, Cavendish-square—An improved machine for reaping corn. (A com.)
 1455. G. Morris, Regent-street—An imp. in shirt and other collars.
 1457. C. W. Siemens, John-street, Adelphi—Imp. in cleansing tidal rivers.
 1459. W. E. Newton, 68, Chancery-lane—A new mode of applying engraved plates, or electrotype or other substitutes for such plates, to the cylinders of printing presses, and of applying other parts of such presses in combination with the cylinders to enable perfect impressions to be taken from the cylindrical surfaces of the plates. (A com.)
Dated 29th June, 1858.
 1461. F. A. Calvert, Manchester—Imp. in machinery for cleaning and preparing cotton, wool, and other fibrous materials.
 1463. J. Shaw, Manchester—A machine to manufacture square paper and other bags.

1465. J. Harcourt, Broad-street, Birmingham—An improved adjustable spindle for locks and latches.
 1467. W. Baker, 8, Albert-villas, Seven Sisters-road, Holloway—Imp. in constructing covered ways for the passage of sewage on the banks of rivers.
Dated 30th June, 1858.
 1469. P. P. C. Barrat and J. B. Barrat, 33, Boulevard St. Martin, Paris—Imp. in machinery for digging, reaping, mowing and performing certain agricultural operations, and for cutting drains and excavating, partly applicable to arrangements for communicating motion for other purposes.
 1471. S. Fattorini, Milan (Italy)—An universal meridian, applicable to mathematical, geometrical, and precise instruments.
 1473. W. Capetnik, Liverpool—Imp. in wheels for carts or vehicles to run on common roads.
Dated 1st July, 1858.
 1475. H. G. Pearce, Liverpool—Imp. in reefing the sails of navigable vessels.
 1477. W. Clark, 53, Chancery-lane—Imp. in griffins. (A com.)
 1479. T. Binkhorn, Spalding, Lincolnshire—Imp. in the construction of steam boilers and engines.
 1481. H. W. Wimshurst, 7, Wilmot-road, Dalston—Imp. in manufacturing sheet metal.
Dated 2nd July, 1858.
 1483. C. F. Vasserot, 43, Essex-street, Strand—An improved wire conductor for electro-magnetic machines. (A com.)
 1485. F. Richmond and H. Chandler, Salford—Imp. in machinery for cutting hay, straw, and other vegetable substances.
 1487. P. R. Hodge, 16, Chalcut-sreecent, Regent's park, and G. Spencer, 6, Cannon-street West—Imp. in the means of preventing or regulating the recoil of springs used in railway engines, carriages, and station buffers.
 1489. W. Sellers, Philadelphia—Imp. in machinery for turning metal shafting or bars and cylindrical rings and cutting screws.
 1491. J. L. Clark, Adelaide-road, Haverstock-hill—An imp. in electric telegraph cables or ropes.
Dated 3rd July, 1858.
 1493. T. Scott, Drummond-street, Euston-square—Imp. in dressing, separating, and cleaning seeds, and in apparatus for them purposes.
 1495. S. Lees, Bury, and J. Jaques, Preston—Imp. in the means for generating steam and economising fuel.
 1497. T. Reestell, New Kent-road—Imp. in breech-loading fire-arms and ordnance, and in ammunition to be used in breech-loading arms.
 1499. J. Chisholm, Bermondsey—A method of disinfecting and deodorizing or treating sewage and other matters and structures and places.
 1501. O. Sarony, Scarborough—Imp. in treating and colouring photographic pictures.
 1503. A. V. Newton, 68, Chancery-lane—Imp. in soldering iron. (A com.)
 1505. E. Hassefely, Kearsley, Lancashire—Imp. in recovering oxides of manganese from products arising out of the manufacture of chlorine, and in raising commercial manganese to higher oxides.
Dated 5th July, 1858.
 1507. R. A. Brooman, 168, Fleet-street—Imp. in the manufacture of cast steel. (A com.)
 1509. J. Hodgkinson, Atherton—Certain improved machinery or apparatus for kneading dough in the manufacture of bread.
 1511. M. Nelson, New York, U.S.—Imp. in propellers for vessels.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1558. W. Northen, 14, Vauxhall-walk, Lambeth—The application of stoneware or earthenware, coloured or plain, to improved and original designs—12th July, 1858.

WEEKLY LIST OF PATENTS SEALED.

- | | |
|---|---------------------------------------|
| July 16th. | 1110. G. M. Cascatini. |
| 2798. W. F. Batho and E. M. Bauer. | July 20th. |
| 88. G. A. Tremeschini. | 100. C. Rishworth. |
| 89. B. B. Wells. | 107. T. Ivory. |
| 93. O. von Corvin. | 120. W. Bedford. |
| 96. R. Martin. | 128. J. Johnston. |
| 98. T. Heppleston. | 154. W. Spence. |
| 101. R. A. Brooman. | 674. T. Steven, T. Reid, and T. Frew. |
| 190. J. Sholl. | 694. A. P. Dudley & N. Brough. |
| 888. G. Smith. | 1148. A. P. Price. |
| 1017. W. Wallis, W. Langford, and J. Slack. | |

PATENTS ON WHICH THE STAMP DUTY OF 2s 6d HAS BEEN PAID.

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|----------------------|--------------------------------------|
| July 12th. | July 16th. |
| 1577. R. Yeaton. | 1599. W. Piddling. |
| 1594. T. Sadleir. | 1620. A. E. L. Ballford. |
| 1608. W. C. Thurgar. | 1629. D. Flaken and T. R. H. Flaken. |
| July 15th. | July 17th. |
| 1586. J. H. Tuck. | 1684. B. Bailey. |
| 1587. F. Burke. | July 19th. |
| 1627. J. G. Lawrie. | 1614. W. Smith. |
| July 18th. | 1623. V. Souty and B. J. Heywood. |
| 1593. J. B. Pascal. | 1634. R. Martin and J. C. Martin. |
| 1633. J. H. Johnson. | 1628. P. Bertinetti. |
| 1634. J. H. Johnson. | 1658. A. Achard. |
| 1642. J. H. Johnson. | |

Journal of the Society of Arts.

FRIDAY, JULY 30, 1858.

NOTICE TO INSTITUTIONS.

In accordance with the resolution passed at the last Annual General Meeting of the Society, the Council will present to each Institution in Union a quarto copy of the Speeches and Addresses of H.R.H. the Prince Consort.

The Department of Science and Art have placed in the hands of the Council a number of copies of the "Introductory Addresses on the Science and Art Department and the South Kensington Museum," delivered there during the last session, and a copy of this work will also be presented to every Institution in Union.

In addition to the above, the Council have decided to present to each Institution copies of twenty-two lectures delivered before the Society of Arts, on the results of the Great Exhibition of 1851.

Institutions desiring copies of these works are requested either to apply for them at the Society's House, or to communicate to the Secretary of the Society of Arts the address of an agent in London to whom they may be sent,

SPECIAL PRIZE.

The Prize of Twenty Pounds (placed at the disposal of the Council of the Society of Arts for this purpose, by the Rev. F. Trench and J. MacGregor, Esq.) and the Society's Silver Medal, offered for a Writing Case suited for the use of soldiers, sailors, emigrants, &c., will be awarded according to the following conditions:—

1. *Weight*.—None will be received weighing above five ounces when empty.
2. *Size*.—The size in length and breadth must not exceed that necessary to hold note paper.
3. *Ink*.—The case must not contain ink in a fluid state.
4. *Durability*.—It must be made of a substance not liable to be spoiled by wet, and which will protect the contents from injury.
5. *Cheapness*.—The retail price, with guaranteed supply, must not exceed 1s. 6d.

Competitors are desired to take notice that the Council reserve to themselves the right of withholding the prize should there be no article of sufficient merit brought under their notice.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 1st of January, 1859.

FINANCIAL PRIZE ESSAY.

Mr. J. T. Danson, Fellow of the Statistical Society; Mr. Charles Neate, Professor of Political Economy in the University of Oxford; and Mr. Jacob Waley, Professor of Political Economy in University College, London, the adjudicators appointed by the Council of the Society of Arts, have reported that they have unanimously selected the Essay marked E. C. S., as deserving the award of the Prize of Two Hundred Guineas, placed in the hands of Council by Mr. Henry Johnson.

As the Council are not meeting at this season of the year, the Chairman, in the presence of the Secretary, has opened the envelope bearing the above motto, and declares that the successful author of the Essay is Mr. Edward Capps, 7, Cheshunt-terrace, Grange-road, Bermondsey.

ARTISTIC COPYRIGHT.

The petition from the Society of Arts, as well as one signed by Members of the Artistic Copyright Committee and others interested in the production of works of Fine Art, were presented to the House of Lords, on Monday last, by Lord Lyndhurst. The petitions were ordered to be referred to a Select Committee, the members of which were at once appointed.

EXAMINATIONS.

The following is a list of the members of the Sussex Local Board of Examiners, as now finally constituted, for the purpose of carrying into effect in Sussex the Examinations of the Society of Arts and the "Middle-Class Examinations" established by the Universities of Oxford and Cambridge:—

Airey, George, Steyning.	Hawkins, Rev. E. C., Brighton.
Allen, Rev. John, Brighton.	Howell, James, Brighton.
Andrews, John, Brighton.	Jardine, Rev. Dr., Brighton.
Attree, W. W., Recorder of Hastings.	Johnstone, Rev. H. I., Brighton.
Banks, John, jun., Hastings.	King, Dr. Wm., Brighton.
Beard, Dr. C. J., Brighton.	King, W. G., Brighton.
Bessant, R. B., Brighton.	Loug, Prof. Geo., Brighton.
Bigge, A., Stipendiary Magistrate, Brighton.	Lower, M. A., Lewes.
Blencowe, R. W., the Hooke, Lewes.	Merrifield, Fred., Brighton.
Bridgen, John, Brighton.	Morris, Rev. Dr., Brighton.
Burrows, J. C., Mayor of Brighton.	Newton, Rev. J., Brighton.
Carey, Rev. Dr., Brighton.	Olding, William, Brighton.
Carpenter, Charles, Brunswick-square, Brighton.	Otter, Rev. Archdeacon, Cowfold.
Cobb, George, Brighton.	Paris, George De, Brighton.
Cole, J. H., Hastings.	Penley, M., Brighton.
Cox, A., Clarence-square, Brighton.	Peto, John, Brighton.
Creak, Rev. Albert, Brighton.	Phillips, M. L., Brighton.
Cresay, Professor, London.	Phillips, Barclay, Hon. Sec., Brighton.
Drummond, Rev. S. R., Brighton.	Ricardo, Moses, Brighton.
Garbett, Rev. Archdeacon, Clayton.	Rickards, P. S., Brighton.
Griffith, Rev. J., Brighton.	Rock, James, Mayor of Hastings.
Grix, John, East Ashling, Chichester.	Savage, W. D., Brighton.
Harper, W. H., Shoreham.	Sleight, Wm., Brighton.
	Smith, Wm. Forster, Brighton.
	Turrell, H. S., Brighton.
	Worfor, T. W., Brighton.
	Wright, Robert, Landm

EXAMINATIONS, 1858.

The following papers, set at the Society's Final Examinations, in May last, are concluded from page 554 :—

ENGLISH LITERATURE.—CHAUCER.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. Write in modern English the following passage :—

A good wif was ther of beside Bathe,
But she was som del defe, and that was scathe.
Of cloth making she hadde swiche an haunt,
She passed hem of Ipres, and of Gaunt.
In all the parish wif ne was ther non,
That to the offering before hire shulde gon,
And if ther did, certain so wroth was she,
That she was out of alle charitee.
Hire coverchiefs weren ful fine of ground ;
I dorste swere, they weyeden a pound ;
That on the Sunday were upon hire hede.
Hire hosen weren of fine scarlet rede,
Ful streite yteyed, and shoon ful moist and newe.
Bold was hire face, and fayre and rede of hew.
She was a worthy woman all hire live,
Housbondes at the chirche dore had she had five,
Withouten other compaignie in youthe.
But therof nedeth not to speke as nouthe.

447—464.

2. Mark the feet. Can you give any rules for the pronunciation of the final *e*?
3. Give Chaucer's declension of the words *he* and *she*, both singular and plural?
4. Write out as much as you can of the description of the Personne in the words of the original.
5. Explain the words :—Chevalrie, arwes, couthes, coude, sote, yaf, purfild, yeddinges, swiche, limitour, penes, gat-tothed, lewed, achatours, adradde, arette, o, unces, wood, digne, barres.
6. Give all the parts of the verb "to be" that you find in Chaucer.
7. Explain the phrases, "at your aller cost ;" "fayn wolde I do you mirthe and I wiste how ;" "and have a thank and yet a cote and hood ;" "and yet this manciple sette hir aller cappe ;" "ne was not worldly to have an office."

DIVISION II.

1. Give an account of Chaucer's life, and some notice of the author whom he is said to have imitated.
2. Write in modern English the following passage :—

At Alisandre he was whan it was wonne.
Ful often time he hadde the bord begonne,
Aboven alle nations, in Pruce.
In Lettowe hadde he reysed and in Ruce,
No cristen man so ofte of his degre.
In Gernade at the siege eke hadde he be
Of Algeris, and ridden in Balmarie.
At Leyes was he, and at Satalie,
Whan they were wonne ; and in the Grete see
At many a noble armee hadde he be.
At mortal batailles hadde he ben fittene,
And foughten for our faith at Tramissene
In listes thries, and ay slain his fo.

51—63.

3. Give the situation of the places mentioned above, and explain the historical allusions.
4. Give instances of sarcasm in this Prologue.
5. Write out the description of the Squire. Was there a difference in social rank between him and Frankelien?

ONE HO

1. Write in pro following :—

Thou, wretch
If in true ball
For never Kn
More luckless
Witness the d
Thy life shut
And though
Yet death the
Into the which
Why then do
To draw thy
Is not the me
High heaped
Against the d
Is not enough
Thou falsed h
And sold thy
With whom in

2. Explain the part of the Book.
3. Give the subject of Lucifera.
4. What is the meaning of the words :—ydrac, portesse, stow.
5. Mention the name of the author.
6. Compare the style of the author and explain the meaning of the words.
7. Describe the stanza.
8. Write out the words which you find in the words.

1. Give a short notice of the Faery Queen.
2. What fault is there in the Faery Queen?
3. From what metre is the Faery Queen written?
4. What was Spenser's opinion of the Faery Queen?
5. Mention any of Spenser's later works.

TH

1. Explain the meaning of the words :—Thou, nature, My services, Stand in the, The en, For, I, I, I.

2. Write the character of Edgar in King Lear, supporting your description by references or quotations.

3. Give the plot of the concluding Act.

4. Explain the following passages, giving the context in which each occurs, and mentioning any variation in the reading:—

For the apparel oft proclaims the man ;
And they in France of the best rank and station
Are of a most select and generous chief in that.

Do not believe his vows; for they are brokers;
Not of the eye which their investments show.

Marry, sir, here's my drift,
And, I believe, it is a fetch of warrant.

Pray God, your voice, like a piece of uncurrent gold
be not cracked within the ring.

That monster, custom, who all sense doth eat,
Of habits devil, is angel yet in this,
That to the use of actions fair and good
He likewise gives a frock or livery.

He, being remiss,
Most generous, and free from all contriving,
Will not peruse the foils.

5. Describe the character of Laertes.

6. Trace the steps by which the Ghost is introduced into the play, and describe the part that he plays.

7. Explain the following passages, giving the context in each case, and mentioning any various readings:—

For when my outward action doth demonstrate
The native act and figure of my heart
In complement extern, 'tis not long after
But I will wear my heart upon my sleeve
For daws to peck at.

Whereof by parcels she had something heard,
But not intently.

One that excels the quirks of blazoning pens,
And in the essential vesture of creation
Does tire the ingener.

Exchange me for a goat,
When I shall turn the business of my soul
To such exsufficate and blow'd surmises,
Matching thy inference.

How have I been behaved, that he might stick
The small'st opinion on my least misuse.

8. Describe the steps by which Iago works out his purpose of deceiving Othello.

DIVISION II.

1. From what sources is Shakespeare supposed to have obtained the materials of his plots for Othello, King Lear, and Hamlet?

2. Compare the characters of Kent and Gloucester in King Lear.

3. What supernatural machinery does Shakespeare use? Compare his use of Heathen Mythology with Milton's.

4. What dramatists of note preceded Shakespeare? Did he ever copy any of them?

5. How far is a dramatic poet bound to satisfy our notions of justice? Examine with this view the conclusion of King Lear. Does the moral effect of a play depend on its representing good as always triumphant?

6. Compare the three heroines of these tragedies. Examine how far each character is adapted to the interest attached to it in the play.

7. What is Shakespeare's object in interweaving comic scenes and characters into his tragedies? Mention any instance that you remember, and comment upon it in detail.

BACON.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. How does Bacon prove that the Syllogism is not sufficient for the investigation of Nature?

2. Mention any remarkable instances of the *Idola speciei*. Under which head will common superstitions fall? And under which common rumours?

3. Distinguish accurately between *Idola tribus* and *Idola fori*, and give instances to illustrate your distinction.

4. Explain what Bacon means by saying that a recurrence to final causes has corrupted philosophy.

5. What does Bacon say of the different philosophical effects produced by the systems of Aristotle and of Plato? What does he mean by comparing empirical philosophers to ants, dogmatical to spiders?

6. By what instances does Bacon attempt to show that there is hope for science in the hidden powers of nature?

DIVISION II.

1. Give a sketch of the scheme of which the *Novum Organum* was intended to be a part.

2. Give instances of Bacon's remark that men prefer saving their axioms by some frivolous distinction to mending them.

3. What is the difference between *lucifera* and *fructifera experimenta*? Give instances of both kinds, and show that in the end the *lucifera* are also *fructifera*.

4. Give some account of that philosophy of the Schoolmen which Bacon's system was intended to overthrow.

5. Give a sketch of the state of science when Bacon wrote.

6. Bacon says, that "Forms are the figments of the human mind, unless we may call the laws of the action of matter by the name of forms." Explain what is meant here by the word forms.

7. What did the Schoolmen mean by occult qualities? How much truth was wrapped up in this phrase? Illustrate your answer by instances.

MILTON.

ONE HOUR AND A HALF ALLOWED.

1. Explain the following passages, giving the context in each case:—

They left me then when the grayhooded even,
Like a sad votarist in palmer's weed,
Rose from the hindmost wheels of Phœbus' wain.

I have often heard
My mother Circe, with the Sirens three
Amid the flowery kirtled Naiades,
Culling their potent herbs and baleful drugs;
Who as they sung would take the prisoned soul
And lap it in Elysium; Scylla wept
And child her barking waves into attention,
And fell Charybdis murmured soft applause.

Not that Nepenthes which the wife of Thone
In Egypt gave to Jove born Helena.

And what if seventh to these
The planet earth, so steadfast though she seem,
Inensibly three different motions move?
Which else to several spheres thou must ascribe,
Moved contrary to thwart obliquities,
Or save the sun his labour, and that swift
Nocturnal and diurnal rhomb suppos'd,
Invisible else above all stars, the wheel
Of day and night.

Paradise Lost, viii.

Spot more delicious than those gardens feigned
Or of revived Adonis, or renowned
Alcinous, host of old Laertes' son;
Or that not mystic where the sapient king
Held dalliance with his fair Egyptian spouse.

As when two polar winds blowing adverse
Upon the Cronian sea, together drive
Mountains of ice that stop the imagined way
Beyond Petsora eastward, to the rich
Cathaian coast.

2. Give the argument of the eleventh Book of *Paradise Lost*.

3. Write out, as nearly as you can in the words of the original, Milton's description of the first day's creation.

4. Explain the following words, and quote, where you can, lines in which they occur:—purged, crisped, soothest, bolt (verb), bosky, empyrean, Pegasean, epicycle, maugre, budge, emprise, welkin.

5. By what argument does Milton make the serpent persuade Eve, and Eve persuade Adam?

6. What distinction of character is maintained between the two brothers in *Comus*?

DIVISION II.

1. Give a short account of the life of Milton and of the date and occasion of each of his writings.

2. Mention any critics who have written on Milton's poems and the tenor of their criticisms.

3. What rules of metre does Milton observe? Quote passages to show the variety of his rhythm.

4. Quote instances of unusual grammatical constructions. State in each case, if you can, the source from whence he obtained them.

5. Quote any allusions that occur in the *Paradise Lost* to Milton's personal history, or to the events of the day.

6. Compare the different angels in *Paradise Lost*, and point out the distinctions in their several characters.

POPE.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. Explain the following passages, giving the context in each case:—

When the dull ox, why now he breaks the clod,
Is now a victim, and now Egypt's god.

Reason the card, but passion is the gale.

The fiery soul abhorred in Catiline,
In Decius charms, in Curtius is divine.

See Falkland dies the virtuous and the just:
See godlike Turenne prostrate on the dust:
See Sidney bleeds amid the martial strife.

Heroes are much the same, the point's agreed,
From Macedonia's madman to the Swede.

To all beside as much an empty shade
An Eugene living, as a Cæsar dead:
Alike or when or where they shone or shine,
Or on the Rubicon or on the Rhine.

2. Describe Pope's theory of the Master or Ruling passion.

3. What comparison does Pope make between Reason and Instinct?

4. What is Pope's account of the origin of Civil Government?

5. Write out, in the words of the original, the ironical command in the opening of the second Epistle, bidding man attempt all knowledge. Explain the allusions in the passage.

6. Mention any lines in the *Essay on Man* which have become common quotations, and give the context in which each occurs.

DIVISION II.

1. In what sense is it true that Pope is a very correct poet?

2. What kind of influence did Pope exert on succeeding writers? How far was that influence different from that of Dryden?

3. From whom is Pope said to have obtained the theory on which the *Essay on Man* is founded? What are the obvious objections to that theory?

4. Point out real or apparent inconsistencies in the Argument, and, when possible, defend the Poet from the charge.

5. It has been said that the *Essay on Man* tends to the denial of a future state. Examine this statement.

6. Mention and characterize the most remarkable Poets that have directly imitated Pope.

7. Describe briefly Pope's other writings.

BURKE.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. Narrate the historical facts which justify the following statements:—

The Babylonian, Assyrian, Median, and Persian monarchies must have poured out seas of blood in their formation and in their destruction.

The kings of Syria and of Egypt, the kings of Pergame and Macedon, without intermission worried each other for above two hundred years.

What an Aceldama, what a field of blood Sicily has been in ancient times!

Denmark sought a refuge from the oppression of its nobility in the stronghold of arbitrary power.

Athens was the city which banished Themistocles, starved Aristides, forced into exile Miltiades, drove out Anaxagoras, and poisoned Socrates.

2. Give the arguments which Burke founds on the state of the law to prove the mischief of artificial society.

3. Give the substance of Burke's account of the Passion of Sympathy.

4. "I know of nothing sublime, which is not some modification of power." How does Burke illustrate this position?

5. What qualities does Burke consider to make up our notion of Beauty? Give his argument in regard to any one of them.

6. Give the substance of Burke's examination of Locke's opinion concerning darkness.

7. What does Burke remark on the effect of Words?

8. Mention Burke's objections to the project of giving Representatives to our American provinces.

9. What does Burke say on the maxim, "Not man but measures?"

10. Write out, as nearly as you can in the words of the original, the peroration of the *Reflections on the Revolution in France*.

11. What was Necker's project for regulating the French finances? What are Burke's remarks on the project?

12. On what basis did the French Revolutionists, according to Burke, propose to rest their constitution? Give Burke's argument against their plan.

DIVISION II.

1. Give a sketch of Burke's life, and a short account of his writings, and mention the names of his most distinguished literary and political contemporaries.

2. What is the purpose of the Vindication of Natural Society? Would the argument be always effectual?

3. What other theories of the nature of Beauty have been proposed? And by whom? Compare any one of them with that advocated by Burke.

4. Mention the most remarkable characteristics of Burke's style? and illustrate your answer by quotations.

5. Quote striking similes or other figures of that kind from Burke's writings.

6. How far can it be said that the progress of the French Revolution changed the tenor of Burke's political sentiments? What effect had that Revolution on other great minds that witnessed it?

7. What was the nature of the French Parliament abolished by the Revolution? To what purpose would Burke have had them applied? Is there anything similar in our own constitution.

8. How far have Burke's anticipations in regard to France been realized since he wrote?

WORDSWORTH.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. Illustrate the following passage by a short account of the mythology and histories to which it refers:—

With unrivalled skill,

As nicest observation furnished hints

For studious fancy, did his hand bestow

On fluent operations a fixed shape;

Metal or stone, idolatrously served.

And yet—triumphant o'er this pompous show

Of Art, this palpable array of Sense,

On every side encountered; in despite

Of the gross fictions chanted in the streets

By wand'ring Rhapsodists; and in contempt

Of doubt and bold denial hourly urged

Amid the wrangling Schools—a Spirit hung,

Beautiful Region! o'er thy Towns and Farms,

Statues and Temples, and memorial Tombs.

2. Narrate the story of Ellen from the "Churchyard among the Mountains."

3. Give the argument of "Despondency corrected."

4. Write out, as nearly as possible in the words of the original, the description of the Raven, heard as she flies cross the valley in which the Solitary was dwelling.

5. Explain the allusions in the following:—

Egyptian Thebes,

Tyre by the margin of the sounding waves,

Palmyra, central in the Desert, fell;

And the Arts died by which they had been raised.

—Call Archimedes from his buried Tomb

Upon the plain of vanished Syracuse,

And feelingly the sage shall make report

How insecure, how baseless in itself,

Is the Philosophy whose sway depends

On mere material instruments.

6. Give the substance of the comparison made by the poet between the manufacturing and agricultural life.

7. Write out or give the substance of any remarkable description of scenery that you may remember in the "Excursion." What are the chief characteristics of Wordsworth's descriptions of scenery?

8. Describe the feeling said to have been excited by the beginning and progress of the French Revolution.

9. Wordsworth rarely uses similes. Quote any that you can remember.

DIVISION II.

1. Wordsworth is said to be sometimes prosy. Explain what is meant by this. Give instances; and examine how much, if any, truth there is in the charge.

2. What is Wordsworth's avowed principle in regard to poetic diction? Give instances in which he seems to have carried it too far. Give instances in which he seems to have himself transgressed it.

3. What critics have attacked Wordsworth in prose or poetry? And what has been the tenor of their criticism?

4. Give a classified list of Wordsworth's writings, and remark upon the difference observable between his later and earlier poetry.

5. What is the moral purpose of the "Excursion"? And how far is it attained?

6. Describe the view seen by the Solitary after the search for the man lost in the mountains. What is the purpose with which it is introduced here by the Poet?

BUTLER.

ONE HOUR AND A HALF ALLOWED.

DIVISION I.

1. By what argument does Butler establish the immortality of the soul?

2. On what basis does Butler discuss the question of necessity? Point out the advantage of choosing such a basis.

3. How far does a belief in the moral government of God go beyond a belief in his government by Rewards and Punishments? If the latter be established, what additional proof is needed to establish the former?

4. What use does Butler make of the limited scope of our faculties as an argument in favour of religion?

5. What objections does Butler anticipate as likely to be made against his whole argument? And how does he answer them?

6. How does Butler answer the presumption from Analogy against miracles?

7. Explain the distinction which Butler draws between self-love and the particular passions.

8. How does Butler answer the objection to his system, that vice is as natural as virtue?

9. Give Butler's proof that conscience is a faculty superior in kind to the other faculties

DIVISION II.

1. What objection may be made to the very groundwork of the Analogy? And how would Butler answer it.

2. How does Butler deal with the supposed case of a man convinced that virtue does not really tend to happiness, or vice to misery? And how does he contrast his system with that of Shaftesbury in this respect?

3. Butler alludes in his preface to the Epicurean system of Philosophy. Give an account of that system. What modern writers belong more or less to the same school?

4. What answer might be made to Butler's argument for the indivisibility of the soul? And what to his inference thence drawn of the immortality of the soul?

5. What other English writers on morals may be considered as followers or as opponents of Butler?

6. Is conscience considered by Butler as a moral or an intellectual faculty? What philosophical advantage is gained and what lost by his determination of the point?

LATIN AND ROMAN HISTORY.

THREE HOURS ALLOWED.

Candidates are not allowed to work more than two out of the four Sections into which this Paper is divided, and are not expected to answer more than six questions in Section III. or IV.

SECTION I.

Translate literally into English prose:—

Nunc, Patres conscripti, ego mea, video, quid intersit. Si eritis secuti sententiam C. Cæsaris: quoniam hanc is in republica viam, quæ popularis habetur, secutus est, fortasse minus erunt, hoc auctore et cognitore hujusce sententiæ, mihi populares impetus pertimescendi: sin illam alteram; nescio, an amplius mihi negotii contrahatur. Sed tamen meorum periculorum rationes utilitas reipublicæ vincat. Habemus enim a C. Cæsare, sicut ipsius dignitas et majorum ejus amplitudo postulabat, sententiam, tanquam obsidem perpetuam in rempublicam voluntatis. Intellectum est, quid intersit inter lenitatem concionatorum et animum vere popularem, salutem populi consulentem. Video de istis, qui se populares haberi volunt, abesse non neminem, ne de capite videlicet civium Romanorum sententiam ferat. Is et nudius tertius in custodiam cives Romanos dedit, et supplicationem mihi decrevit, et indices hesterno die maximis præmiis affecit. Jam hoc nemini dubium est, qui reo custodiam, quætori gratulationem, indici præmium decrevit, quid de tota re et causa judicarit.

1. Parse fully, auctore—pertimescendi—negotii—concionatorum—videlicet—hesterno.

2. Account for the mood of vincat—intersit—ferat—judicarit.

3. Give the perfect, supine, and infinitive of eo—gaudeo—fero—edo.

4. Explain briefly—

Patres conscripti.

Populares.

De capite sententiam ferat.

Supplicationem.

Quætori.

SECTION II.

Translate into English prose:—

Hæc dum Dardanio Æneæ miranda videntur, Dum stupet, obtutuque hæret defixus in uno, Regina ad templum, forma pulcherrima Dido, Incessit, magna juvenum stipante caterva. Qualis in Eurotæ ripis, aut per juga Cynthi Exerces Diana choros, quam mille secutæ Hinc atque hinc glomerantur Oreades; illa pharetram Fert humero, gradiensque deas supereminet omnes; Latonæ tacitum pertentant gaudia pectus: Talis erat Dido, talem se læta ferebat Per medios, instans operi regniæque futuris. Tum foribus divæ, media testudine templi, Septa armis, solioque alte subnixæ, reседit. Jura dabat legesque viris, operumque laborem Partibus æquabat justis, aut sorte trahebat.

1. Parse fully, giving the rules of Syntax where necessary, Æneæ—miranda—forma—stipante—gradiens—ferebat—operi—subnixæ—sorte.

2. Conjugate the verbs from which we have, videntur—hæret—supereminet—instans—reседit—trahebat.

3. Decline the pronoun *se*; and state the difference between the following:—

Sui amicus.

Ejus amicus.

Suus amicus.

4. What is meant by a deponent verb? What peculiarity is there in its participles? Give examples.

SECTION III.

1. What events in Roman History are connected with the following dates, B.C. 509—451—396—348—340—264—302—146?

2. Give a short account of Servius Tullius; and describe the changes in the constitution ascribed to him.

3. Compare the *legendary* and *historical* accounts of the war with Persæa.

4. What events led to the first appointment of Tribunes of the Plebs? Describe the duties and powers of these officers.

5. Who was Spurius Cassius? Explain the object of the law which was named after him.

6. Mention the causes, and results, of the great Latin war.

7. Give the dates, and state the objects, of the

Lex Publilia.

Lex Canuleia.

Lex Hortensia.

8. Mention some of the principal incidents in the third Samnite war.

9. Describe the course of events in the second Punic war, after the battle of Cannæ.

10. "Ille triumphata Capitolia ad alta Corinthe Victor ager currum, cæcis insignis Achivæ."

—Æt. vi.

Explain the allusion in this passage; and state what circumstances, and with what results, Rome came into collision with Greece.

SECTION IV.

1. Mention, with dates, the chief events in Roman History in one of the following periods:

i. B.C. 65 to B.C. 42.

ii. B.C. 42 to B.C. 31.

2. Give an account of the troubles under the Gracchi.

3. Sketch the life of

Scipio Africanus,

Marius, or,

Cato, the Censor.

4. Write a short account of the Jugurthine war.

5. Describe the war with

Viriathus,

Sertorius, or,

Spartacus.

6. Where was Pergamum? How did it come into the possession of the Romans? Mention some of the immediate, and ultimate, results of this addition to their territories.

7. Name the members of the two Triumvirates, and mention the fate of each of them.

8. What were the chief features in the legislation of Sylla? State the objects which he professed to have in view.

9. What was the extent of the Roman dominions at the death of Augustus? How were the Roman provinces governed?

10. Gibbon describes the system of imperial government, under Augustus, as "an absolute monarchy disguised by the forms of a commonwealth." Explain and explain this statement.

FRENCH.

THREE HOURS ALLOWED.

I.

Translate into English any two, and not more than two, of the following extracts; and answer (in French if possible) the questions respectively appended to each of those two extracts.

M. Jourdain. Voilà des mots qui sont trop rébarbatifs. Cette logique-là ne me revient point. Apprenons autre chose qui soit plus joli.

Le Maître de Philosophie. Voulez-vous apprendre la Morale.

M. Jourdain. La morale?

Le Maître de Philosophie. Oui.

M. Jourdain. Qu'est ce qu'elle dit, cette morale?

Le Maître de Philosophie. Elle traite de la félicité, enseigne aux hommes à modérer leurs passions, et.....

M. Jourdain. Non; laissons cela. Je suis bilieux comme tous les diables, et il n'y a morale qui tienne: je me veux mettre en colère tout mon soufre, quand il m'en prend envie.

1. Give a biographical sketch of Molière, with a list of his works.

2. Explain the plot of the *Bourgeois Gentilhomme*.

(4.) From Boileau's *Lutrin* (Chant I):—

La Discorde, à l'aspect d'un calme qui l'offense,
Fait siffler ses serpents, s'excite à la vengeance:
Sa bouche se remplit d'un poison odieux,
Et de longs traits de feu lui sortent par les yeux.

Quoi! dit-elle d'un ton qui fit trembler les vitres,
J'aurai pu jusqu'ici brouiller tous les chapitres,
Diviser Cordeliers, Carmes et Célestins;
J'aurai fait soutenir un siège aux Augustins;
Et cette église seule, à mes ordres rebelle,
Nourrira dans son sein une paix éternelle!
Suis-je donc la Discorde? et, parmi les mortels
Qui voudra désormais encenser mes autels?

A ces mots d'un bonnet couvrant sa tête énorme,
Elle prend d'un vieux chantre et la taille et la forme;
Elle peint de bourgeois son visage guerrier,
Et s'en va de ce pas trouver le trésorier.

1. Give a biographical sketch of Boileau; name his principal works.

2. Explain the subject of the *Lutrin*, and also the names of Cordeliers, Carmes, Célestins, and Augustins, introduced in the above passage.

(5.) From Guizot's *Histoire de la Civilisation en Europe* (Leçon I):—

Il n'est presque aucune grande idée, aucun grand principe de civilisation qui, pour se répandre partout, n'ait passé d'abord par la France.

C'est qu'il y a dans le génie français quelque chose de sociable, de sympathique, quelque chose qui se propage, avec plus de facilité et d'énergie que le génie de tout autre peuple: soit notre langue, soit le tour de notre esprit, de nos mœurs, nos idées sont plus populaires, se présentent plus clairement aux masses, y pénètrent plus facilement; en un mot, la clarté, la sociabilité, la sympathie sont le caractère particulier de la France, de sa civilisation, et ces qualités la rendaient éminemment propre à marcher à la tête de la civilisation Européenne.

Lors donc qu'on veut étudier l'histoire de ce grand fait, ce n'est point un choix arbitraire ni de convention, que de prendre la France pour centre de cette étude; c'est au contraire se placer, en quelque sorte, au cœur de la civilisation elle-même, au cœur du fait qu'on veut étudier.

1. State what you know of M. Guizot's literary career; name his principal works.

2. Explain as fully as possible the meaning which M. Guizot attaches to the word *Civilization*.

II.

1. Mention briefly, with dates, the most important events of the reigns of Clovis and Charlemagne.

2. Explain the following historical expressions: *Lois saliques*, *Capitulaires de Charlemagne*, *Etats-généraux*, *Pragmatique sanction* (Charles VII), *Edit de Nantes*, *Pragmatique du Jeu du Faumé*.

LATIN AND GREEK

THREE HOURS

Candidates are not allowed to
of the *four* Sections into which
and are not expected to answer
in Section III. or IV.

S.

Translate literally into English:

Nunc, Patres conscripti,
Si eritis secuti sententiam
is in republica viam, quae
fortasse minus erunt, hoc
sententiae, mihi populus
illam alteram; nescio, quid
hatur. Sed tamen meum
reipublicae vincat. Habet
ipsius dignitas et maiestas
sententiam, tanquam omnis
voluntatis. Intellectum
concionatorum et animi
consulentem. Video quod
volunt, abesse non in
civium Romanorum
tius in custodiam civem
mihi decrevit, et in
affectit. Jam hoc me
quasitori gratulatio
de tota re et causa
1. Parse fully, the
cionatorum—videt
2. Account for
judicavit.
3. Give the
gaudeo—fero—
4. Explain it.

Translate

Hæc dum dicit
Dum stupet
Regina ad
Incessit, non
Qualis in
Exercet
Hinc atq
Pert hum.
Matone t.
Talis era
Per medi
Tum for
Septa ad
Jura dai
Partibus

1. Pa
cessary,
ferabat—
2. Co
—haret—
3. Dec
between t

4. W
Harity

check again, as soon as you have compared it with your work.

FREE-HAND DRAWING.

FOUR HOURS ALLOWED.

The Local Boards are requested to place the following objects on a Table before the Candidates in Free-hand Drawing:—

A half-pint mug, a wine bottle, and a stone jar, put together in a triangle.

A Geranium plant.

Candidates in Free-hand Drawing are required to make clear and distinct outlines in chalk or pencil, without indicating the shadows, of the subject given; they may use charcoal and Indian rubber, but not a rule or instrument. A Candidate may choose either of the following sets of subjects; and if the time will allow, there is no objection to his drawing more than one

MANUFACTURED ARTICLES.

Draw from knowledge a ball about seven inches in diameter, on a cube of four inches, the cube to be represented with one angle toward the spectator.

Draw the door and doorway of the room you are in.

Draw an open umbrella from memory.

ORNAMENTS.

Draw the ball as before given.

Draw the plant which is set before you.

Design a pattern from the plant which shall be suited to printing or weaving.

HUMAN FORM.

Draw the ball as before given.

Draw, from memory, an eye, a nose, and a mouth, skilfully in profile, the size of life.

Draw a nude figure, from memory, about two feet

HANICAL OR GEOMETRICAL DRAWING.

THREE HOURS ALLOWED.

The drawings and constructions must be neat, distinct and accurate; the principles employed clearly indicated, but no verbal explanations or numerical calculations admissible.

Each Candidate must draw all his figures on one large sheet of paper.

More than two questions from each of the Sections A, B, C, D, may be answered by any candidate.

Five questions well solved from Section E will be as equivalent to eight from the preceding sections.

One answer from each of A, B, C, D, with two from E will rank next in value.

Four answers (one to a question in four different sections) are the fewest that can be admitted as constituting satisfactory examination.

Candidates are advised to consider each question well before proceeding to the construction, and to bear in mind that distinct and accurate drawing is the important point to be attended to.

(A) PRACTICAL PLANE GEOMETRY.

1. On a line of two inches as a side, describe a regular polygon.

2. Construct a square of 3 inches area, and a rectangle equal to it, having its sides as 2 : 1.

3. Draw two lines to contain an angle of 60° and a circle of two inches diameter to touch both.

4. On a line of two inches as a chord, describe the circle of a circle to contain an angle of 120°.

5. Draw the circles inscribed, and circumscribing a triangle of 3, 4, 5; and 3 inches sides.

6. Draw an ellipse having its axes 3 and 2 inches.

(A) PRACTICAL SOLID GEOMETRY, OR ORTHOGRAPHIC PROJECTION.

1. Show by its plan and elevation a line 3 inches long, inclined to the plane of the paper 30°, and having one extremity half an inch from it.

2. Show the plans of three horizontal lines at 1, 2, 3 inches respectively above the plane of the paper, but lying in a plane inclined to it at 60°.

3. Draw the plan and elevation of a square of 2 inches side when two sides are inclined at 20° and 30° to the plane of the paper and one corner in it.

4. A right prism 3 inches long with a regular hexagon of 75 inches side, rests on one edge on the paper, and one face inclined to it at 25°. Show the solid by its plan, and by an elevation on a plane having the horizontal edges inclined to it at 50°.

5. Draw the plan and elevation of a cube of 2.25 inches edge when three of its corners are at 1; 1.6; 2.75 inches above the plane of the paper.

6. A right pyramid 3.5 inches high having a regular pentagon of an inch side for its base has one corner resting on the paper and one edge vertical; show the solid by its plan and elevation.

(C) PERSPECTIVE PROJECTION.

N.B. The plane (of projection) of the picture is supposed to be vertical, the place of the eye, or point of sight, is 6 inches in front of the plane, and 2.5 inches vertically above the horizontal plane.

1. One edge of a square of 2 inches side is in the plane of the picture, and the plane of the square is vertical, but inclined at 30° to the plane of the picture.

2. A regular hexagon of one inch side lies in the horizontal plane, one angle touches the picture and a diameter makes an angle with it of 20°.

3. A cube of 1.5 inches edge, one edge in the plane of the picture, and one face inclined to it at 20° rests on the horizontal plane.

4. A circle of 2 inches diameter lies in the horizontal plane and touches the plane of the picture.

Note.—The position, with respect to the eye, of the objects in all these four questions may be assumed at pleasure.

(D) SUBJECTS FOR DRAWINGS IN ORDINARY PLAN AND ELEVATION.

1. Design an arch of 20 feet span in stone, the arch-stones to have chamfered edges, and show how they are connected with the horizontal courses of rusticated masonry. Scale, $\frac{1}{4}$.

2. Show three courses of a brick-wall, two-and-a-half bricks thick, with the proper bond in plan and elevation. Scale $\frac{1}{4}$.

3. Draw the timber truss for a foot-bridge of 30 feet span. Scale, $\frac{1}{4}$.

4. Show how a beam of 7 by 10 inches may be best scarfed. Scale, $\frac{1}{4}$.

5. Show how the double queen post, the tie beams and struts of a roof are framed together, and the form of the iron straps or stirrups. Scale, $\frac{1}{4}$.

6. Show the mode of uniting the crank and crank-rod of any machine, or part of one. Scale, $\frac{1}{4}$.

7. Draw an octagonal nut for a two-inch screw bolt. Scale, $\frac{1}{4}$.

8. Draw a chair for a rail, with the mode of keying the rail in. Scale, $\frac{1}{4}$.

(E) QUESTIONS FOR SOLUTION FOR CANDIDATES WITH MORE THAN AN ELEMENTARY KNOWLEDGE OF GEOMETRY.

1. Draw half the cycloid generated by a point in the circumference of a circle, of 1.3 inches radius, rolling along a straight line (semi-circumference = 4.084 inches).

2. Draw three turns of a triangular-threaded screw, 3.5 inches diameter and 1.25 inches pitch.

3. Show by their plans and elevations three spheres of 1, 2, 3 inches diameter, resting on a horizontal plane each touching the other two; mark the points of con-

"The most important decorating works here are of Messrs. Haviland and Co., of New York, who won a silver medal, and to whose courtesy I was indebted for permission to visit their establishment, where, nearly enough, the leading hands are from England. While Minton, Copeland, and the manufacturers of the Potteries import French decorators, the manufacturers of French china at Limoges employ English decorators and ornamentalists. Nor is this the only instance. Englishmen are employed in the same branch; for example, near Paris, the chief engravers of designs are Bohemians."

GALVANIC BATTERIES.

M. Petrouchoffsky, of Kieff, in Russia, has been experimenting on the electro-magnetic forces of the various descriptions of galvanic batteries, and puts forth the following table of relative values as the result of his researches:—

Daniell's sulphate of copper, and dilute sulphuric acid, with amalgamated zinc	100
The same battery, with zinc not amalgamated	93
Daniell's sulphate of copper, and a strong solution of chloride of sodium, with amalgamated zinc	105
The same battery, with zinc not amalgamated	101
Daniell's, with the sulphuric acid replaced by a solution of tartrate of potash, with amalgamated zinc	105
With zinc not amalgamated	99
Wollaston's, with amalgamated zinc	93
Bunsen's, with amalgamated zinc	169
Bunsen's, with the carbon cylinder replaced by cast iron, with amalgamated zinc	172
Grove's, with amalgamated zinc	178

The effect of the amalgamation of the zinc to increase its electro-motive force is clearly shown.

M. Petrouchoffsky adds that it is impossible that the numbers arrived at by different experimenters should agree perfectly, because in operating with any one given battery there will be always some slight differences, it being absolutely necessary that the metals and liquids should be chemically pure.

SOUTH KENSINGTON MUSEUM.

During the week ending 24th July, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,726; on Monday and Tuesday (free evenings), 4,551. On the three Students' days (admission to the public 6d.), 827; one Students' evening, Wednesday, 93. Total, 9,197.

Proceedings of Institutions.

WINDSOR AND ETON.—The half-yearly meeting of the Literary, Scientific, and Mechanics' Institution was held on Monday, the 6th June last. There was a large attendance of the members. In the unavoidable absence of Captain Bulkeley, the President, John Clode, Esq., one of the vice-presidents, was called upon to take the chair. Mr. C. T. Phillips, the honorary corresponding secretary, read the minutes of the general meeting held in December last, the report of the committee for the half-year, and the auditors' balance-sheet. From these documents it appeared that the Society was in a very flourishing state, the balance in hand amounted to £20 On. 2½d. in the savings' bank, besides £30 invested in the nucleus of a building fund, and bearing in mind that nearly £40 had been laid out in improving the premises of the Society, and that the cost of new books, periodi-

cals, and newspapers during the past half-year had been nearly £25 more, the above statement may be considered very satisfactory. There were stated to be 35 more members than there were in the preceding June. The annual income yielded by the subscriptions was stated at £156 11s. In the library there had been several valuable additions, including Tighe and Davis's Annals of Windsor. The adoption of the report and balance sheet was carried on the proposition of Captain Wilson, R.N., and Mr. Boyce and Messrs. Hanson and Cobden respectively. It was also resolved that copies of both documents should be forwarded to H.R.H. the Prince Consort. The following gentlemen were then elected to serve on the committee, Mr. Dyson, the Rev. W. C. Bromhead, Mr. Wheeler, Mr. R. Smith, Mr. Dewe, Mr. Little, and Mr. Willmore; Mr. Turnock and Mr. Cleave were re-elected auditors. Some alterations in the rules passed at the last meeting were confirmed, and notice was given of some further additions that would be proposed at the next meeting. Several suggestions for the consideration of the committee were mentioned, particularly one, about which all present seemed unanimous, namely, that another Fête should take place with as many improvements as possible. The following votes of thanks were passed unanimously:—To the committee and officers of the Society on the proposition of the chairman and Mr. Adams; to the gratuitous lecturers and teachers of classes, proposed by Messrs. J. H. Passmore and Atkins; to the local press for their valuable services, on the proposition of Messrs. Lundy and Brooke; and to John Clode, Esq., for the manner in which he had officiated as chairman, on the proposition of Messrs. C. T. Phillips and Wheeler. After a brief speech in acknowledgment from the chairman, the meeting broke up.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Part. No.

- Delivered on 21st July, 1858.*
- 394. Hainault Forest—Report from Mr. Charles Gore.
 - 401. Land Transport Corps—Report from Committee.
 - 404. Highways—Return.
 - 433. Inland Revenue—Return.
 - 324. Joint Stock Companies—Return.
 - 223. Bills—New Writs (as amended in Committee, and on Re-commitment.)
 - 224. ——— Consolidated Fund (Appropriation).
- Delivered on 22nd July, 1858.*
- 387. Divine Worship in Pulpit Districts—Lords' Reports.
 - 383. Caledonian Canal—33rd Report of Commissioners.
 - 420. County Rates (Ireland)—Report from Committee.
 - 424. War Department—Return.
 - 437. Land Transport Corps—Copies of Despatches.
 - 442. River Thames—Report from Committee.
 - 419. Metropolitan Main Drainage—Return.
 - 225. Bills—Gaols and Houses of Correction (No. 2).
 - 226. ——— Clerk of Petty Sessions (Ireland) (as amended in Committee and on Re-commitment).
 - 227. ——— Militia Act Continuance (No. 2).
 - 228. ——— Militia (Service Abroad) Act Continuance.
 - 230. ——— Saint Mary Magdalen (Newcastle) Charity.
- Delivered on 23rd July, 1858.*
- 397. William Henry Bar's Petition—Report from Committee.
- Delivered on 24th July, 1858.*
- 201 (12). East India (Revenues, &c.)—Account.
 - 410. Dublin Metropolitan Police—Abstract of Return.
 - 434. British Museum—Copy of Report.
 - 435. Jeffries' Smoke-Consuming Apparatus—Return.
 - 436. Tottenham Court-road Accident—Return.
 - 447. Navy (Number of Able Seamen, &c.)—Return.
 - 449. Friendly Societies (Ireland)—Report of the Registrar.
 - 420. County Rates (Ireland)—Report, &c., from Committee.
 - 214. Bills—Debtors and Creditors.
 - 211. ——— Drafts on Bankers' Law Amendment (as amended in Committee and on Re-commitment).
 - 232. ——— New Writs (as amended in Committee, on Re-commitment and on second Re-commitment).
 - Public Works (Ireland)—26th Report of the Board.
- Delivered on 26th July, 1858.*
- 441. Bury's Traction Engine—Return.
 - 444. Slave Trade—Returns.
 - 68 (6). Trade and Navigation Accounts (30th June, 1858).
 - 222. Mill—Factories.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, July 23, 1858.]

Dated 5th June, 1858.

1274. W. Hooper, Mitcham, Surrey—Imp. in the manufacture of projectiles.

Dated 28th June, 1858.

1452. J. Luis, 18, Welbeck-street, Cavendish-square—An apparatus permitting the different parts of machinery working in the water of screw vessels with wells to be examined and mended. (A com.)
1454. J. Morgan, Rotherhithe—Imp. in machinery or apparatus for manufacturing or spinning rope yarns or other yarns.
1456. J. C. Coombe, 10, Alfred place, Newington causeway, South-wark—Imp. in the method of and apparatus for manufacturing manures from fecal and other matters.
1458. W. E. Newton, 66, Chancery-lane—An improved mode of and apparatus for making nails. (A com.)
1460. B. Young and P. Brown, Spa-road, Bournemouth—An improved method of collecting and disposing of the sewage of towns or cities.

Dated 25th June, 1858.

1464. J. Shaw, Manchester—A machine to manufacture conical paper and other bags.
1466. H. N. Nissen, 43, Mark-lane—A method of preparing paper for receiving stains or copies from letters and other writings.

Dated 20th June, 1858.

1470. W. S. Wheatcroft and J. N. Smith, Manchester—Imp. in locks, fastenings, or safeguards, making them self acting or partially self acting.
1474. J. Petrie, jun., Rochdale—Imp. in machinery or apparatus for drying warps of yarn or thread, and woven fabrics.

Dated 1st July, 1858.

1480. T. Riddell, Carraon-terrace, Old Ford, Bow—Imp. in the construction of omnibuses, and in breaks to be applied to such and other wheel carriages.

Dated 2nd July, 1858.

1482. W. T. Smith, 21, Lincoln's-inn-fields—Imp. in and the combination of certain machinery or apparatus for winnowing, washing, sifting, and separating grain, ballast, sand, shot, minerals, and other materials.

1484. J. Morris, Broughton Copper Works, Salford—An improved construction of or improvements in the construction of copper rollers or cylinders for printing fabrics.

1488. A. V. Newton, 66, Chancery-lane—Certain imp. in lamps. (A com.)

1490. T. Melldow, J. Duxbury, and E. Layfield, Oldham—Imp. in machinery or apparatus for spinning and doubling or twining cotton and other fibrous materials.

1492. D. Le Souëf, Twickenham—An improved shaft-bearer, or tug, and an improved manner of affixing the same to the harness. (A com.)

Dated 3rd July, 1858.

1494. J. Billing, Abingdon-street, Westminster—Imp. in fire-places or stoves.

1496. C. Buhning, Great College-street, Camden-town—Imp. in apparatus for filtering liquids and other fluids containing impurities.

1498. W. Bond and T. Standing, Preston—Imp. in apparatus for churning, mixing, and stirring cream, milk, and other liquids.

1500. J. G. Jennings, Holland-street, Blackfriars, and J. Lovegrove, Victoria-park road—Imp. in water-closets, and in apparatus used in ventilating house drains or sewers.

Dated 5th July, 1858.

1506. E. Simons, Birmingham—Imp. in castors for furniture.
1508. G. J. Newbery, Straltmouth, Greenwich—Imp. in the manufacture or production of coverings for floors, applicable also to the manufacture of table mats, and other articles or coverings.

1510. T. Woolner, Blue Pits, Lancashire—Imp. in apparatus for feeding steam boilers with water.

1512. J. Greenwood, South Audley-street—Imp. in marine propellers.

Dated 6th July, 1858.

1513. J. T. Davies, Liverpool—An improved lock. (A com.)

1516. H. Hueb's, Homerton—Imp. in ruff ring and clamping machines, parts of which are applicable to the manufacture of continuous belts and shutters.

1516. W. E. Newton, 66, Chancery-lane—Imp. applicable to roller blinds. (A com.)

1517. J. Davis and T. Evans, Ulverston, Lancashire—Imp. in engines to be actuated by steam, air, or gases.

1518. J. Buchanan, Port Glasgow, Renfrew, N.B.—Imp. in propelling ships, vessels, and boats.

Dated 14th July, 1858.

1519. W. A. Smith, Belper, Derbyshire—Imp. in machines for making bricks, tiles, or pipes of clay.

1520. H. C. Schiller, London—Certain improved apparatus for laying down and recovering submarine telegraphic cables.

1521. J. J. Florence, Paris—Imp. in reels or spooling wheels.

1522. P. Micrier, Paris—Imp. in the treatment of peat, and in preparing the same for fuel.

1523. J. Holland, Gibb-street, Deritend, and F. Potts, Deritend, Birmingham—Certain improvements in ornamenting metallic bedsteads, and which said improvements are also applicable to the ornamenting of other metallic surfaces.

1534. W. Cilsold, Dudbridge, Gloucestershire—Improved machinery for cutting or rasping dyewoods.

1526. T. James, Saint George's-in-the-East—Imp. in treating scrap matter.

1526. G. A. B. Chick, 56, Milk-street, Leek-lane—An imp. in the preparation of graphite or plumbago or black lead.

1527. G. T. Bousfield, Loughborough park, Brixton—Imp. in apparatus for ironing linen and other fabrics. (A com.)

1528. J. D. Weston, Stour Valley Iron Works, West Bromwich—Imp. in rolling iron for the manufacture of bolts and pins.

1529. A. W. Stelch, Mansell-villas, Wimbledon-park—Imp. in the construction of floating sea barriers, or artificial beaches, breakwaters, and batteries.

Dated 8th July, 1858.

1531. J. Marland, Glodwick, near Oldham, and J. Widdall, Abing-hill, Lancashire—An improved self-acting hook or bolt to prevent accidents in lifting, hoisting, or winding at coal pits or other similar purposes.

1532. H. Gidlow, Atherton, Lancashire—Imp. in breaks for steam engines.

1533. J. B. Booth, Preston, and R. Ashworth, Heywood, Lancashire—Imp. in the means of stopping or retarding the progress or velocity of railway carriages.

1534. P. F. Demoulin and J. Cotelie, Paris—Imp. in treating the heavy oils obtained from the distillation of coals, shales, and other hydro-carbons.

1535. T. T. Chellingworth, West Bromwich—A high-pressure steam engine.

1536. P. R. Hodge, 16, Chaloot-crescent, Primrose-hill—Imp. in brewing fermented liquors, and in treating materials and therein for purposes of food.

1537. R. Smith, Sheffield—An improved adjustable pipe tong. (A com.)

1538. S. Samuels, New York—Imp. in laying submarine telegraphic cable.

1539. S. Harrison, Stanhope-street, Clare-market—Imp. in ovens.

1540. P. J. Crickmer, Borough-road—Imp. in treating the sewage of London and neighbourhood.

1541. R. G. C. Fane, Upper Brook-street—Imp. in treating sewage, and in apparatuses to be employed therein.

1542. M. Scott, 3, Stanhope-street, Hyde park-gardens—Imp. in constructing breakwaters, and other like structures.

1543. G. Collier, Halifax—Imp. in means or apparatus for the drying of wool and other fibre.

1544. G. Sampson, Bradford—Imp. in means or apparatus employed in the finishing of woven fabrics.

Dated 9th July, 1858.

1545. W. Simons, Glasgow—Imp. in or connected with ships or vessels.

1547. J. Broadley, Saltaire, near Bradford—Imp. in means or apparatus employed in weaving.

1549. C. N. Kottula, Liverpool—Imp. in the manufacture of masses.

1551. J. M. Rowan, Glasgow—Imp. in manufacturing wrought-iron wheels and bosses or centres, and in the mode of, and inances for, heating the same during such manufacture. (A com.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1562. M. A. F. Mennona, 39, Rue de l'Ecluse, Paris—Imp. in the construction of fire-engines and similar apparatus. (A com.)—12th July, 1858.

1641. J. V. N. S. Petriwalaky, Pall-mall—Imp. in the manufacture of bread, and in the apparatus to be employed therein.—20th July, 1858.

WEEKLY LIST OF PATENTS SEALED.

July 23rd.

132. J. J. Welch and J. S. Margeson.

134. A. Wall.

157. T. Armistage.

174. R. Coleman.

197. F. F. Dillage.

203. J. Harrison.

287. G. L. Blyth.

300. J. E. Boyd.

688. H. Napier.

711. W. Crowley.

845. J. H. Johnson.

926. E. Hunt and H. D. Pochin.

1133. J. Adamson.

July 27th.

159. J. Bothell.

164. R. A. Brooman.

169. H. W. Hart.

169. W. Kaye and O. Kaye.

172. J. Newling.

176. T. Taylor, sen., T. Taylor, jun., H. Nelson, and E. Spencer.

180. G. Bartholomew.

184. R. A. Brooman.

185. R. A. Brooman.

186. W. J. Hay.

216. J. Welch.

233. J. Wells.

246. E. Stevens.

248. W. S. Clark.

271. A. V. Newton.

309. W. E. Newton.

341. G. Schaub.

367. W. E. Newton.

678. W. Oldfield and T. O. Dixon.

725. O. Barony.

770. H. Baerriichter and C. C. Gottfried.

809. C. Mather and H. Charlton.

930. J. H. Bennett.

1016. H. Jackson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

July 19th.

1640. H. D. P. Cunningham.

1656. S. J. Pittar.

- July 21st.

1693. C. Schiele.

July 22nd.

1692. H. W. Ripier.

1694. R. A. Brooman.

1691. Tony Pettigrew.

July 23rd.

1691. W. Westons and G. A. Crow.

Journal of the Society of Arts.

FRIDAY, AUGUST 6, 1858.

NOTICE TO INSTITUTIONS.

In accordance with the resolution passed at the last Annual General Meeting of the Society, the Council will present to each Institution in Union a quarto copy of the Speeches and Addresses of H.R.H. the Prince Consort.

The Department of Science and Art have placed in the hands of the Council a number of copies of the "Introductory Addresses on the Science and Art Department and the South Kensington Museum," delivered there during the last session, and a copy of this work will also be presented to every Institution in Union.

In addition to the above, the Council have decided to present to each Institution copies of twenty-two lectures delivered before the Society of Arts, on the results of the Great Exhibition of 1851.

Institutions desiring copies of these works are requested either to apply for them at the Society's House, or to communicate to the Secretary of the Society of Arts the address of an agent in London to whom they may be sent.

A separate copy of the Programme of Examinations for 1859, given below, has been forwarded by post to every Institution in Union.

SPECIAL PRIZE.

The Prize of Twenty Pounds (placed at the disposal of the Council of the Society of Arts for this purpose, by the Rev. F. Trench and J. MacGregor, Esq.,) and the Society's Silver Medal, offered for a Writing Case suited for the use of soldiers, sailors, emigrants, &c., will be awarded according to the following conditions:—

1. *Weight.*—None will be received weighing above five ounces when empty.
2. *Size.*—The size in length and breadth must not exceed that necessary to hold note paper.
3. *Ink.*—The case must not contain ink in a fluid state.
4. *Durability.*—It must be made of a substance not liable to be spoiled by wet, and which will protect the contents from injury.
5. *Cheapness.*—The retail price, with guaranteed supply, must not exceed 1s. 6d.

Competitors are desired to take notice that the Council reserve to themselves the right of withholding the prize should there be no article of sufficient merit brought under their notice.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 1st of January, 1859.

PROGRAMME OF EXAMINATIONS FOR 1859, WITH AN APPENDIX.

NOTICE TO THE INSTITUTIONS.

1.—In 1856 the Society's Examinations were held in London.

2.—In 1857 they were held in London and Huddersfield.

3.—In 1858 they were held at—1. Banbury; 2. Berkhamstead; 3. Birmingham; 4. Blackburn; 5. Bradford; 6. Brighton; 7. Bristol; 8. Greenwich; 9. Halifax (2 Local Boards); 10. Hartlepool (West); 11. Ipswich; 12. Leeds (2 Local Boards); 13. Lewes; 14. Liverpool; 15. Lockwood; 16. London (5 Local Boards); 17. Louth; 18. Lynton; 19. Macclesfield; 20. Manchester (2 Local Boards); 21. Newcastle-on-Tyne; 22. Northowram; 23. Pembroke Dock; 24. Portsmouth; 25. Salisbury; 26. Selby; 27. Sheffield; 28. Wakefield; 29. Warminster; 30. Wigan; 31. Windsor; 32. York.

4.—In 1859, and thenceforward, it is proposed to hold them simultaneously at all places, throughout the extent of the Union, where suitable arrangements can be made by the authorities of the Institutions.

5.—The Council invite the Institutions in Union to assume a large share of authority and responsibility in the management of the Examinations.

6. Bearing in mind that the Union of Institutions was formed for the purpose, not of superseding, but of promoting and supplementing, the action and self-government of those bodies, the Council have adopted the following scheme of

Previous	} Examinations by the	{ Local Authorities. Society of Arts.
Final		

PREVIOUS EXAMINATIONS BY THE LOCAL BOARDS.

7.—The Institutions in different parts of the Union are invited to appoint Local Boards, who will conduct the previous Examinations of their own Candidates, and also supervise the working of papers which the Society's Examiners will set for the Society's final Examinations.

8.—No Candidate can be admitted to the final Examination without a Certificate (see form No. 4 in Appendix) from his Local Board, that he has satisfactorily "passed" its previous Examination (a) in the elementary subjects specified in par. 11, 12, 13, 14, and (b) in the special subjects in which he wishes to be examined by the Society's Examiners.

9.—The previous Examinations must be held by the Local Boards sufficiently early in the year, to allow the results to be communicated to the Council four weeks before the 17th of May, 1859, the day fixed for the commencement of the Society's final Examinations.

10. Unreserved communications between the Society and the Local Boards will be requisite to secure to the "passes" of the various Local Boards throughout the Union such a uniformity of value as may be attainable; and it is hoped that their standard may be raised, carefully and gradually, from year to year, in order that the scope and authority of those bodies may be constantly on the increase.

11.—The previous Examinations of the Local Boards may be either oral or written, or partly oral and partly written, as each Local Board may think best suited to its locality. These Examinations are to test the handwriting and spelling of the Candidates, their knowledge of English grammar, composition, and the common rules of arithmetic, as well as their knowledge of those

special subjects in which they seek to be examined by the Society's Examiners.

12.—**HANDWRITING.**—A bold even round-hand, without loops, longtails, or flourishes, should be preferred.

13.—**ENGLISH GRAMMAR AND COMPOSITION.**—An extract from some standard English author should be set, into which errors of spelling, grammar, and punctuation should be introduced. Some faulty grammatical constructions in common use, and vulgarisms, should be submitted for correction.

14.—**ARITHMETIC.**—A knowledge of the elementary Rules, including the Rule of Three, should be required.

FINAL EXAMINATION BY THE SOCIETY'S EXAMINERS.

15.—The names of the "passed" Candidates, and the subjects in which the Society is to examine them, must be made known to the Council four weeks before the day fixed for the Society's final Examinations. (See Time-table, Form No. 6, in Appendix.)

16.—The Society's Examiners will then set the requisite papers for the final Examination; and these will be forwarded to the Local Boards. The Local Boards will see, and certify to the Council, in the form which the Council will furnish (see Appendix, Form No. 7), that the papers are fairly worked by each Candidate, without copying from any other, and without books or other assistance; and will return the worked papers to the Council.

17.—No person who shall not have been, for three months previously, a member of, or student of a Class in, an Institution in union with this Society; no person under sixteen years of age; no graduate or undergraduate of any University of the United Kingdom; no student of any of the learned professions; no certificated schoolmaster or pupil-teacher; and no person who has not satisfactorily "passed" the previous Examination of the Local Board in 1859, is eligible for examination by the Society's Examiners. No Candidate obtaining a First Class Certificate in any subject can come up for Examination in that subject in any subsequent year.

18.—The final Examination will be conducted by printed papers.

19.—The Examiners will award Certificates of three grades, but Certificates of the first grade will be awarded only to a high degree of excellence.

20.—The final Examination will be held simultaneously, on the days, and at the hours, specified in the Time-table for 1859 (Appendix, Form No. 6.), at such places, throughout the Union, as can make satisfactory arrangements for the previous Examinations by the Local Boards, and for the supervision of the working of the papers in the final Examination by the Society's Examiners.

21.—Judgment will then be passed by the Society's Examiners, and the Awards, Prizes, and Certificates will be communicated to the parties concerned.

22.—The following is the list of subjects for the Final Examination in 1859:—

- I. Arithmetic.
- II. Bookkeeping, by Double Entry.
- III. Algebra.
- IV. Geometry and Mensuration.
- V. Trigonometry.
- VI. Conic Sections.
- *VII. Navigation and Nautical Astronomy.
- VIII. Statics, Dynamics, and Hydrostatics, Hydraulics, and Pneumatics.

* Each of the five subjects which are marked with an asterisk in this list was taken up by fewer than four Candidates in the Final Examinations in 1857 and 1858. The Council therefore give notice that in 1859 no Paper will be set by the Society's Examiners in any of those five subjects unless the candidate shall be informed, before the 1st of February, 1859, that he is preparing himself in these subjects, for the Examination.

IX. Practical Mechanics.

X. Magnetism, Electricity, and Heat.

*XI. Astronomy.

XII. Chemistry.

XIII. Animal Physiology.

*XIV. Botany.

*XV. Agriculture.

*XVI. Political and Social Economy.

XVII. Geography.

XVIII. English History.

XIX. English Literature.

XX. Latin and Roman History.

XXI. French.

XXII. German.

XXIII. Theory of Music.

23.—Drawing has been withdrawn from the list of subjects, not because the Council consider that Drawing is unimportant—for they are of opinion that every one ought to be taught to draw—but because the Government has provided, in all parts of the kingdom, for the Annual Examination of Candidates in Drawing; and the Council think that it would be a waste of resources for the Society of Arts to follow in the steps of the Government with similar proceedings. An account of the Government Examinations in Drawing is given in the Appendix.

24.—To guide the reading of the Candidates, and to indicate the portions of the subjects that will be taken in the Examinations, the Examiners in the several departments have set down certain text-books. But they desire it to be distinctly understood that in so doing they do not pronounce any opinion as to the comparative merit of the works named. The selection is in most cases determined by the cheapness of the book, or by its being in common use. Real knowledge, however wherever acquired, will be accepted by the Examiners of the Society of Arts.

I.—ARITHMETIC.

25. Practice, Interest and Discount—Proportion, Simple and Compound—Fractions, Vulgar and Decimal. The principles of a Decimal Notation in money on the basis of the pound unit.

26. The Examiners will take into account not only the correctness of the work, but the clearness with which it is set down, and the neatness of the figures. Round, compact figures, as nearly like as possible to old fashioned printed numerals, will be preferred.

27. Any of the modern Treatises on Arithmetic, such as Hunter's Text Book (*National Society*), Colenso (*Logmans*), or Barnard Smith (*Bell & Daldy*), may be used.

II.—BOOKKEEPING BY DOUBLE ENTRY.

28. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office. They should be prepared to journalize a series of transactions from a waste book and, having posted the entries to the ledger, to balance the accounts, to prove them by a trial-balance, and finally to exhibit an account of profit and loss, with a balance-sheet.

29. Candidates will be required to draw the commercial forms, such as receipts, bills of exchange, promissory notes, invoices, account sales, accounts of rent, bills of parcels, and to explain the meanings of the technical terms used in general business.

30. The following books, or some of them, may be consulted:—

- Book-keeping, Irish School Series. (*Groombridge.*)
- Rudimentary Book-keeping. (*Weale's Series.*)
- Kelly's Elements of Book-keeping. (*Stapledon & Co.*)

III.—ALGEBRA.

31. Algebraical Fractions, Square and Cube Root, Greatest Common Measure, Least Common Multiple.

Simple and Quadratic Equations single and simultaneous, Ratio, and Variation. Candidates should be prepared to give explanations of Elementary Principles and proofs of Fundamental Propositions.

32. Colenso's Algebra (*Longmans*), or Barnard Smith's Algebra (*Bell and Daldy*), may be used with advantage.

IV.—GEOMETRY AND MENSURATION.

33. Euclid, Books I, II, III, IV, VI, XI and XII. Potts' smaller edition is recommended. (*Parker*.)

34. A facility in solving geometrical theorems and problems, deducible from the first six books, will be expected on the part of those who desire to obtain high class certificates.

35. The calculation in numbers of the areas and circumferences of plane figures bounded by arcs of circles or right lines. The superficial and solid contents of cones, cylinders and spheres, &c.

36. Candidates will be expected to be familiar with the different rules for measuring and estimating artificer's work, such as joiner's, bricklayer's, mason's, slater's, and plumber's work, and to be able to prepare estimates for such work from given quantities.

37. The following books may be consulted:—
Rudimentary Treatise on Mensuration. (*Weale's Series*.)

Young's Treatise on Mensuration. (*Simms and McIntyre*.)

V.—TRIGONOMETRY.

38. In Plane Trigonometry, the formulæ for the trigonometrical functions of the sum of two angles, the numerical solution of plane triangles, and the use of logarithmic tables.

39. Snowball's Trigonometry, (*Macmillan, Cambridge*.) Hall's Trigonometry for Schools, (*Christian Knowledge Society*), or any of the modern treatises on Algebraical Trigonometry may be consulted. Mathematical Tables, (*Chambers' Series*.)

40. Spherical Trigonometry, Napier's Rules, Solution of Spherical Triangles.

VI.—CONIC SECTIONS.

41. The properties of the three curves treated geometrically. Also as deduced from the cone. The principles of projection, orthogonal and central, applied to derive the properties of the Conic Sections from those of the circle.

42. Drew's Conic Sections, (*Macmillan*), or Whewell's Conic Sections. (*Parker*), may be consulted. For Analytical Conics, Puckle's or Todhunter's Conic Sections.

VII.—NAVIGATION AND NAUTICAL ASTRONOMY.

43. A good knowledge of Plane and Spherical Trigonometry, of the definitions and terms used in Nautical Astronomy, and of the various measurements of time and their mutual conversions will be required, as well as skill in the use of logarithmic tables, and neatness, order, and accuracy, in the numerical solutions of problems. The candidate should understand the construction of charts; the nature and laws of circular storms; great circle sailing, &c. The methods of determining the latitude, longitude, variation of the compass, and error and rate of a chronometer by astronomical observations, with the demonstrations of the formulæ employed. The use of Nautical Astronomical Instruments, &c.

44. The Nautical Almanac, Riddle's Navigation and Nautical Astronomy. (*Law, Essex-street*.)

VIII.—STATICS, DYNAMICS, HYDROSTATICS, HYDRAULICS, AND PNEUMATICS.

45. The Properties of Matter; Force and Motion; the Mechanical Powers; Regulation of Force; the Pendu-

lum; the Strength of Materials, &c.; the Mechanical Properties of Liquids; Specific Gravity; Mechanical Properties of Air; the Barometer; Machines for raising Water, &c.

IX.—PRACTICAL MECHANICS.

46. The Application of the Principles of Mechanism to Simple Machines. The Steam Engine.

X.—MAGNETISM, ELECTRICITY, AND HEAT.

47. The following books may be consulted:—
Lardner's Handbooks of Natural Philosophy. (*Walton and Maberly*.)

Brooke's edition of Golding Bird's Elements of Natural Philosophy. (*John Churchill*.)

Herschel's Discourse on the study of Natural Philosophy (*Longmans*) for a general view of the subject.

XI.—ASTRONOMY.

48. The principles of Plane Astronomy.

Herschel's Astronomy. (*Longmans*.) First chapters.

Airy's Lectures on Astronomy.

XII.—CHEMISTRY.

49. Organic and Inorganic. Candidates will be examined in the chemistry of the metalloids and of the chief metals; the laws of combining proportions; volumes of gases and vapours, &c. They are expected to be able to explain decompositions with the use of symbols. Questions illustrative of general principles will be selected from the following amongst other trades and manufactures: Metallurgy of Lead, Iron, and Copper; Bleaching, Dyeing, Soap-boiling, Tanning; the manufacture of Coal-Gas, Sulphuric Acid, &c.

XIII.—ANIMAL PHYSIOLOGY.

50. The general principles of Animal Physiology. Practical Application of them to health, and the wants of daily life.

51. The following books are recommended:—
Carpenter's Manual. (*Churchill*.)
Lardner's Animal Physics. (*Walton and Maberly*.)
Translation of Milne Edwards's Manual of Zoology. (*Renshaw*.)

XIV.—BOTANY.

52. Scientific and Applied Botany. The leading principles of Morphology, Vegetable Physiology, and the Classification of Plants. The Examination will include the characters of important Natural Orders represented in the British Flora; and a knowledge of indigenous or commonly cultivated plants, having noxious or useful properties, will be required.

53. The following text-books may be used:—
Lindley's School Botany. (*Longmans*.)
Henfrey's Rudiments of Botany. (*Van Voorst*.)
Henfrey's Elementary Course of Botany. (*Van Voorst*.)

XV.—AGRICULTURE.

54. The theory of agriculture, and such a general knowledge of farm practice, and of the management of live stock as must, to some extent, have been obtained in the field. The Examination in the theory of agriculture will include both the mechanical and the chemical aspects of the subject; on the one side the advantages and results of tillage operations, and on the other the influence and the operation of particular manures and of food. The questions in farm practice will test a knowledge of the cultivation of our most important crops, and of the management of our principal domesticated animals.

55. The following books are recommended:—
Lowe's Elements of Practical Agriculture. (*Longmans*.)

Johnston's Agricultural Chemistry. (*Blackwood and Sons.*)

Morton's Cyclopedia of Agriculture. (*Blackie and Son.*)

Stephens' Book of the Farm. (*Blackwood and Sons.*)

XVI.—POLITICAL AND SOCIAL ECONOMY.

56. Elements of Political Economy, by James Mill.
Principles of Political Economy, by John Stuart Mill.
The Phenomena of Industrial Life. Edited by the Dean of Hereford. (*Groombridge.*)

Whateley's Lectures on Political Economy. (*Parker.*)
Dr. E. R. Humphrey's Manual of Political Science. (*Longmans.*)

57. N.B.—The Principles of Political Economy, by John Stuart Mill, need be studied only by those who aspire to a first class Certificate.

XVII.—GEOGRAPHY.

58. All candidates will be expected to possess a sound knowledge of Descriptive Geography, and in particular, of that of the British Empire. They will also be required to sketch from memory maps of any of the countries of Europe, showing the positions of the chief mountain chains, the largest rivers, and the most important towns.

59. The following are useful text books in Elementary Geography:—

Anderson's Modern Geography. (*Nelson.*)

John's Elements of Geography. (*Darton.*)

William Hughes' General Geography. (*Gleig's Series.*)

William Hughes' Geography of the British Empire. (*Gleig's Series.*)

The General Atlas. (*National Society.*)

60. Candidates for certificates of the first and second grade of merit should have a general acquaintance with Physical, Political, and Commercial Geography. The questions in the Examination Paper will give them an opportunity of showing also a deeper acquaintance with any of the following subjects:—

(a) Geology in its relation to Geography.

(b) The distribution of Plants and Animals on the surface of the globe.

(c) Meteorology.

(d) Ethnography.

61. The following text books may be recommended.

William Hughes' Manual of Geography. (*Longmans.*)

Mrs. Somerville's Physical Geography, 2 vols. (*Murray.*)

Guyot's Earth and Man. (*Parker.*)

Black's School Atlas. (*Black.*)

The School Physical Atlas, (either that published by the National Society, or that by Keith Johnston).

An Atlas of the Geography of the British Empire. (*National Society.*)

Page's Introductory Text Book to Geology. (*Blackwood.*)

Page's Advanced Text Book. (*Blackwood.*)

Ansted's Ancient World. (*Van Voorst.*)

Drew's Practical Meteorology.

Latham's Man and his Migrations.

XVIII.—ENGLISH HISTORY.

62. A general knowledge of the outlines of English History. A special knowledge of English History from the commencement of the reign of Henry 2nd to the end of the reign of Richard 2nd.

63. Knight's English History.

Hallam's Middle Ages, chapter viii. (*Murray.*)

Creasy's Rise and Progress of the English Constitution. (*Bentley.*)

XIX.—ENGLISH LITERATURE.

Candidates may take up for examination any two, more than two, of the authors in the following

Chaucer's Prologue to the Canterbury Tales.
Shakespeare. Macbeth, Richard II., Tempest.

Bacon. Essays.

Addison's Contributions to the Spectator.

Goldsmith's Poems.

65. A fair knowledge of the great writers cotemporary with the authors selected will be required for the highest Certificate.

XX.—LATIN AND ROMAN HISTORY.

66. Livy, Book xxi.

Virgil. Æneid, Book ii.

Roman History, to the death of Augustus Caesar.

67. Liddell's History of Rome (in one volume) is recommended as a Text book.

XXI.—FRENCH.

68. Literature:—

Corneille: Le Cid.

Voltaire: Siècle de Louis XIV.

Montesquieu: Grandeur et Décadence des Romains.

Tocqueville: L'Ancien Régime et la Révolution.

Candidates may take up any two, but not more than two, of the above works.

69. History:—Sketches of the reigns of Louis VI., Louis IX., Charles VII., and Louis XIII.

XXII.—GERMAN.

70. Schiller's Geschichte des Dreissigjährigen Kriegs, or Schiller's Wilhelm Tell.

XXIII.—THEORY OF MUSIC.

71. Notation, the modern modes, intervals, time signatures, the staff, transposition, modulation, terms and characters in common use.

72. The Elements of Harmony.

73. Hullah's "Rudiments of Musical Grammar," and "Grammar of Musical Harmony."

74. Arrangements should be made in the Previous Examination by the Local Boards to test Candidates by oral examination in their knowledge or appreciation of the sound of musical successions and combinations. A form of the test to be used for this purpose by the Local Board at the Previous Examination will be sent to such Local Boards as may require it, in due time before the Examination.

LIST OF EXAMINERS FOR 1859.

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|---|--|
| 1. Arithmetic | { Rev. Alexander Wilson, M.A.,
National Society, London. |
| 2. Book-keeping | { John Ball, Esq., of the firm
of Messrs. Quilter and Ball. |
| 3. Algebra | { Rev. Harvey Goodwin, M.A.,
Cambridge. |
| 4. Geometry and Mensuration | { Rev. B. Morgan Cowie, M.A.,
Professor of Geometry at
Gresham College; one of
H.M. Inspectors of Schools. |
| 5. Trigonometry | { William Spottiswoode, Esq.,
F.R.S. |
| 6. Conic Sections | { Rev. Bartholomew Price,
M.A., F.R.S., Sedleian Professor
of Natural Philosophy in the
University of Oxford. |
| 7. Navigation and Nautical Astronomy... | { John Riddle, Esq., F.R.A.S.,
Head Master of the Nautical
Schools, Greenwich. |

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|--|--|
| 8. Statics, Dynamics, Hydrostatics, Hydraulics, and Pneumatics. | Rev. A. Bath Power, M.A., Principal of the Diocesan Training School, Norwich. |
| 9. Practical Mechanics. | T. M. Goodeve, Esq., Professor of Natural Philosophy, King's College, London. |
| 10. Electricity, Magnetism, and Heat ... | Charles Brooke, Esq., M.A., F.R.S., Surgeon to the Westminster Hospital. |
| 11. Astronomy | Rev. Baden Powell, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford. |
| 12. Chemistry | A. W. Williamson, Esq., Professor of Chemistry, University College, London. |
| 13. Animal Physiology. | William Sharpey, Esq., M.D., F.R.S., Examiner in University College, London. |
| 14. Botany..... | Arthur Henfrey, Esq., F.R.S., Professor of Botany, King's College, London. |
| 15. Agriculture | J. C. Morton, Esq. |
| 16. Political and Social Economy..... | Charles Neate, Esq., M.A., Professor of Political Economy in the University of Oxford. |
| 17. Geography | Wm. Hughes, Esq., F.R.G.S., Professor of Geography in Queen's College, London. |
| 18. English History | E. S. Creasy, Esq., M.A., Professor of History, University College, London. |
| 19. English Literature.... | Rev. Samuel Clark, M.A., F.R.G.S., Principal of the Training College, Battersea. |
| 20. Latin and Roman History ... | Rev. F. Temple, D.D., Head Master of Rugby School. |
| 21. French | Alphonse Mariette, Esq., M.A., Professor of French, King's College, London. |
| 22. German..... | Dr. Bernays, Professor of German, King's College, London. |
| 23. Theory of Music..... | John Hullah, Esq. |

PRIZES FOR 1859.

The following Prizes are offered to the Candidates, viz. :—

One First Prize of £5, and one Second Prize of £3 in each of the twenty-three subdivisions of the subjects of Examination.

No Prize in any subject will be awarded to a Candidate who does not obtain a Certificate of the first class therein.

The Prizes will be given in money or in books, at the option of the Candidate.

The following Prizes are offered to the Institutions, viz. :—

To the Institution whose Candidate obtains the above-mentioned first Prize of £5 in each of the 23 Sub-Divisions of Subjects, one Prize of £5. An Institution can take more than one such Prize: but no such Prize can be taken by one Institution unless the Council of this Society are satisfied that the Candidate, in respect of whom the

Prize is claimed, has received at the Institution systematic instruction in the subject for a period of not less than three months.

The following Prizes are offered to the Local Boards, viz. :—

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than ten) bear the largest proportion to its whole number of Candidates. —One Prize of £10.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than eight) bear the largest proportion to its whole number of Candidates. —One Prize of £8.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than six) bear the largest proportion to its whole number of Candidates. —One Prize of £6.

To the Local Board whose Candidates obtaining Certificates of the first class (not fewer than four) bear the largest proportion to its whole number of Candidates. —One Prize of £4.

No Local Board can receive more than one of these Prizes. These sums may be applied by the Local Boards to the payment of the expenses of the Examination, or otherwise, as the Board may deem best, for the promotion of the objects for which it was instituted.

APPENDIX.

The following forms, that will be forwarded at the proper time next year to the Local Boards, are here published in order that the Boards may know beforehand what arrangements they will have to carry out in co-operation with the Council of the Society of Arts.

Form No. 1.

Society of Arts, Adelphi, London, W.C.

SIR,—I forward to you a return (No. 2), which I shall be obliged by your filling up and re-posting to me, as soon as possible, in order that the necessary Forms (No. 4), may be forwarded to you.

I am, Sir, your obedient servant,

P. LE NEVE FOSTER, Secretary.

To the Secretary, Local Board of _____.

Form No. 2.—Return of Candidates who have attended the Previous Examinations.)

Local Board,
_____, 1859.

SIR,—I beg to inform you that, on the _____ of _____ Candidates underwent the Previous Examination; that _____ of these Candidates passed the Examination satisfactorily; and that _____ of them desire to present themselves at the Final Examinations. I have, therefore to beg that you will furnish me with the requisite number of the Forms (No. 4.). I have entered in the margin the numbers of papers, in each subject, that will be required at the Final Examination.

I am, Sir, your obedient servant,

(Signed) _____

Secretary, Local Board,

To P. Le Neve Foster, Esq., Secretary.

* Insert Date,

Insert Number.

Form No. 3.—Circular taking out
supply of Forms No. 4 to Local
Boards.

Society of Arts, Adelphi, London, W.C.

SIR,—I am directed by the Council of the Society of Arts to forward the accompanying forms (No. 4) for the Candidates who are reported to have passed the previous Examination before your Local Board.

I am to request that these forms may be filled up, signed, and returned to me at your earliest convenience, as the number of papers to be prepared, and other important details of the Final Examination, cannot be settled until the returns from all the Local Boards are complete.

One of the forms now sent to you is to be filled up, partly, as you will perceive, by, and partly on behalf of, each Candidate who has passed your previous Examination. Every such Candidate must carefully remember the number entered, in red ink, at the head of the form which is given to him, as this number (and not his name) will have to be entered on each of his papers at the Final Examination, and by it alone will his work be known to the Examiners, or rearranged in the event of any accidental mixture, or displacement, of the papers. A card, bearing a number corresponding with that at the head of the form, will be sent from this office to each Candidate.

You will perhaps have the goodness to keep a list of the Candidates, with the number of each opposite his name, for reference in the case of difficulty. A copy of the list should also be hung up, in some conspicuous place, in the Examination room, which may be specially consulted by the Candidates on the days of the final Examination.

Detailed instructions (Form No. 5), as to the regulations adopted by the Council to secure uniformity and fair dealing in the arrangements for the Final Examination, will be hereafter forwarded to you. In the meantime I have only to repeat my urgent request that the forms sent to you herewith may be returned to me, duly and carefully filled up, *without delay*.

I am Sir, your obedient servant,

P. LE NEVE FOSTER, Secretary.

Form No. 4.—Return of Candidates
who have passed the Previous Ex-
amination.

SOCIETY OF ARTS. UNION OF INSTITUTIONS.

1. Candidate's name, in full _____
2. Age last birthday _____
3. Residence _____
4. Occupation (present or proposed) _____
5. Member of _____ Institution.
6. Student of a Class in _____ Institution.
7. Number of years at school _____
8. Number of years since leaving school _____
9. Father's name _____
10. „ occupation _____

I, the above-named _____
declare that the above returns are correct, and that I
desire to present myself as a Candidate at the ensuing
Examination to be held by the Society of Arts at _____

N.B.—The above returns must be entered by the Candidate in his
own handwriting.

I HEREBY CERTIFY that the above-named _____
has passed
the previous Examination in Handwriting.

English Grammar, and Composition, the elementary
Rules of Arithmetic, including the Rule of Three, and
in the special subjects, in the margin, opposite to which
I have placed my initials.

Signed _____

On behalf and by authority }
of the Local Board of..... }

Dated this _____ day of _____, 1859.

To P. Le Neve Foster, Esq.

N.B.—No person who shall not have been, for three months previously to the Final Examination, a member of, or Student of a Class in, an Institution in Union with the Society of Arts; no person under sixteen years of age; no graduate or undergraduate of any University of the United Kingdom; no student of any of the learned professions; no certificated schoolmaster or pupil teacher; and no person who has not satisfactorily "passed" the Previous Examination of the Local Board, is eligible for examination by the Society's Examiners.

Form No. 5.—(Letter of Instructions.)

Society of Arts, Adelphi, London, W.C.

SIR,—I am directed by the Council of the Society of Arts to inform you that the papers for the ensuing final Examination of Candidates for the Society's Certificates will be forwarded by post, on _____ the _____ of _____, in a parcel addressed to you at _____

You will have the goodness to let me know by telegraph on _____ the _____, in time for the despatch of duplicate papers by that evening's post, if the parcel is not duly delivered to you in the morning of that day.

The papers in each subject will reach you in a separate envelope, the seal of which is to be broken, in the presence of the assembled Candidates, at the commencement of the time appointed for that subject in the Time-table. This direction, as well as the order and *Acquiescence* Examination laid down in the Time-table, must be strictly observed. It is absolutely necessary, for the proper working and ultimate success of these Examinations, that there should not be the least suspicion as to the perfect fairness and equality with which they are conducted at all the different centres; and such suspicions can only be obviated by the simultaneous employment of the same set of papers at each centre. On this, and on the firmness and fidelity with which the members of the Local Board discharge the simple, though somewhat onerous, duties required of them to prevent the possibility of any dishonest dealing on the part of any Candidate while under examination, the success of the present scheme depends.

I am, therefore, to invite your most careful attention to the "Advice to Candidates" which you will find printed at the foot of the enclosed copies of the Time-table, and to the terms of the accompanying Forms of Declaration, one of which Forms will have to be filled up and returned to me, after it has been signed by at least two members of the Local Board, at the end of each meeting of the Candidates. To provide for this it will be necessary that you should immediately make arrangements with your colleagues on the Local Board, to secure the attendance of a sufficient number of them in rotation at the different periods of the Examination. The attention of your Candidates should be drawn to the Time-table now sent to you, and copies of it should be suspended in the Examination Room.

It will further be necessary that the Local Board should provide writing-paper, of foolscap size, scribbling-paper for rough drafts, and blotting-paper for the use of the Candidates, who should be desired to bring their own pens and a small inkstand to the examination room, and nothing else. They should be required, on entering the examination room, to give up all books, papers, *scribbling*

anda, writing-books, or loose blotting-paper which they may have brought with them, under the penalty of immediate exclusion from the Examination if any such articles should thereafter be found in their possession. After such notice, the plea of accident or forgetfulness cannot be admitted.

Stationery should be supplied to each Candidate, at the rate of three sheets of foolscap, and one of scribbling paper, for every paper which he works, together with one sheet of blotting-paper, which should serve for the whole of the Examination. Ruled paper will be forwarded by me for the use of those Candidates who are to be examined in Book-keeping.

The Time-table has been drawn up to meet the general convenience of the whole number of Candidates who will assemble at the different centres.

The Candidates should sit, in the order of their numbers, as far apart from each other as the space at your command will allow. If you cannot spread them out so as to prevent the possibility of communications passing between them, it will be well to disregard the numerical order, and arrange alternately the Candidates who take different subjects.

Three hours only are allowed for each paper.

All writing must cease at the end of the three hours, *to a moment*; and, if there is no clock in the room, it may be well to give notice to the Candidates when one and two hours have elapsed, and again when they are within ten minutes of the end of each sitting.

The Candidates should leave their answers at their seats (with the Examination papers attached to them), after having carefully filed them all together in order through the upper left hand corner. A supply of silk twist and some large needles should be provided for this purpose.

The papers should then be collected—those on each subject separately—and arranged in the order of the Candidates' numbers. After a separate Declaration has been filled up and signed, in reference to the papers on each subject, it should be tied up with them; the whole set, or sets, worked each day should be forwarded on the following morning, either by post (if the numbers are small), or by railway, in *one* parcel addressed to me at this office, with an entry on the cover stating the number and subjects of the papers which it contains. The Council would also be glad if you could conveniently transmit, by the post of the same day on which each parcel is sent off, a separate letter, to announce the despatch of such parcel, and mentioning, (1) The number of papers in each subject which it contains, and (2) whether it has been forwarded by post or rail.

The Council regret to have to saddle you with the observance of so many minute directions, but, as it is impossible, in the multiplicity of particulars which a simultaneous Examination involves, to rectify any serious mistake or omission, the responsibility of every one engaged, whether in arranging or carrying out the details, becomes great in proportion.

I am, Sir,

Your obedient servant,
P. LE NEVE FOSTER, Secretary.

FORM No. 6.—Time-table.

SOCIETY OF ARTS' EXAMINATIONS.—UNION OF INSTITUTIONS. 1859.

The Examinations will be held on the evenings of the 17th, 18th, 19th, and 20th of May, 1859.

The hours of Examination will be from six o'clock to nine.

No Candidate will be admitted after the Examinations shall have commenced.

TIME TABLE FOR 1859.

Tuesday, the 17th May. From 6 to 9 p.m.	Wednesday, the 18th May. From 6 to 9 p.m.	Thursday, the 19th May. From 6 to 9 p.m.	Friday, the 20th May. From 6 to 9 p.m.
Arithmetic. Trigonometry. Magnetism, Electricity, and Heat. Agriculture. English History.	Book-keeping. Navigation and Nautical Astronomy. Cane Sections. Chemistry. English Literature. Music.	Algebra. Practical Mechanics. Astronomy. Physiology. Political Economy. French.	Geometry and Mensuration. St. Uss. &c. Botany. Geography. German. Latin.

No Candidate may work more than one paper in each evening.

ADVICE TO CANDIDATES.

1. Read over the Time-table carefully, and note the hours appointed for the subjects in which you wish to be examined. Be at your seat in the Examination Room *five minutes before the hour appointed* for each Paper which you are to work.

2. When the Paper is given to you, *first* look to the instructions printed at the head of it, and *then* read the questions carefully over, marking those which you think you can answer best. Do them *first*, and if any time remains, you may try some of the others, but do not exceed the number of questions appointed to be answered. Remember that a few accurate and sensible answers will gain a higher number of marks than a great number of indifferent attempts.

3. No Candidate will be allowed to resume the working of a Paper after he has once left the room in the course of the time appointed for that Paper.

4. If a Candidate has any question to ask, or wants anything in the course of the Examination, he should not leave his place; but *should stand up and call out his number*, when some one will attend to him.

5. As soon as notice is given (10 minutes before the end of the time) finish your Papers, see that they are numbered rightly, and in their proper order, and leave them UNFOLDED at your seat.

CAUTION.

6. No Candidate may speak to another Candidate, on any pretence whatever, under pain of immediate expulsion.

7. Any Candidate detected in taking unfair advantages, such as referring to any Book, or Written Paper, or in seeking assistance from another, will be subject to the same penalty.

8. Whoever gives assistance will be treated in the same manner as he who asks for it.

9. Stationery, including Blotting-paper, will be furnished by the Local Board for the use of the Candidates. No one can be permitted to bring anything into the Room with him, except an inkstand and a supply of such pens as he is in the habit of using.

FORM No. 7.—(Declaration.)

DECLARATION.

Local Board of _____

We, the undersigned, hereby declare that the papers on _____ which are forwarded herewith, were worked, in our presence, by the Candidates whose numbers they respectively bear, without any assistance whatever, from books, notes memoranda, from each other, or from any other person. We declare that not more than three hours were occupied in working these papers; that they were worked at the time appointed for them in the Time table issued by the Society, and that no Candidate was allowed to resume,

(a) Insert Number.

(b) Insert Subject.

or complete, a paper after having left the Examination room in the course of the time assigned to that paper; We further declare that the paper of questions given to each Candidate was taken from the envelope in which it was transmitted from the Society of Arts, the seal of this envelope being broken in our presence, and in that of the assembled Candidates, at the commencement of the time appointed for the paper in the time table issued by the Society; and, finally, we declare that not fewer than* of our number were present during the whole time that the Candidates were engaged on these papers.

Name, designation, and address of members of Local Board who were present during the working of the papers referred to in the above declaration.†

GOVERNMENT DRAWING EXAMINATION.

The Department of Science and Art holds an examination in drawing once in the year, in every town where there is a School of Art.

At this examination any person, of any age or sex, educated at the School or otherwise, may come up for examination and is eligible to take rewards.

In such towns the period of examinations may be learnt at the School of Art.

In places where there are no Schools of Art, provided that the names of fifty persons who will come up for examination in drawing, are sent in to the Secretary of the Department at South Kensington, arrangements will be made for an Inspector to hold such an examination; when awards of drawing Instruments, Materials, &c., are made to those who have attained a given amount of competency.

A book, entitled *Elementary Drawing*, is published for the Department of Science and Art by Messrs. De la Rue and Co., Bunhill-row, and Messrs. Chapman and Hall, Piccadilly, which illustrates the nature of the examination.

LITERARY AND ARTISTIC COPYRIGHT.

A Committee has been formed at Brussels, for the purpose of organising a congress to discuss the subject of Literary and Artistic Copyright. The Committee consists of the following:—

CHARLES FAIDER, ancien ministre de la Justice, avocat général à la Cour de cassation, membre de la classe des lettres de l'Académie royale, *President*.

VERVOORT, membre de la Chambre des Représentants, président du Cercle artistique et littéraire de Bruxelles, *Vice-President*.

ED. ROMBERG, Directeur des affaires industrielles au Ministère de l'Intérieur, *General Secretary*.

VANDER BELEN, Directeur de la division des lettres, sciences et beaux-arts au même département.

BARON, professeur de l'histoire de la littérature Française, à l'Université de Liège, membre de la classe des lettres de l'Académie royale.

ED. FETTS, conservateur adjoint à la Bibliothèque royale, membre de la classe des beaux-arts de l'Académie royale.

GUILLAUME GEEFS, statuaire, directeur de la classe des beaux-arts de l'Académie royale.

* State the number, which in no case must be less than two.

This declaration must be signed, in every case, by, at least, two of the members of the Local Board; and, when more than twenty Candidates are examined at any one sitting, by, at least, three such members. It must not in any case, be signed

by a member of the Board from whom any of the Candidates received instruction in the subject of the paper to which

PORTAELS, peintre d'histoire, membre de la classe des beaux-arts de l'Académie royale.

STALLAERT, homme de lettres, professeur de langue flamande à l'Athénée royal de Bruxelles.

CASTIER, avocat à la Cour d'appel de Bruxelles.

The Congress will meet at Brussels on the 27th September next, in the Great Hall of the Belgian Academy of Sciences, Literature, and Art, and the sittings will probably last four or five days.

Members of the Society of Arts desirous of attending the Congress should communicate with the Secretary to the Committee, M. Edouard Romberg, 58, Rue Royale, Brussels.

The following is the programme of questions which it is proposed to bring under the consideration of the Congress:—

I.

Should the principle of international recognition of the proprietary rights of authors and artists in their works form an element in the legislation of all civilized nations?

Should this principle govern the conduct of one nation towards another, even in the absence of reciprocity?

Should the rights of foreign and native authors and artists be absolutely and in every respect similar?

Should foreigners be called upon to pass through special formalities in order to obtain these proprietary rights, or ought it to be sufficient for them to comply with such regulations as are required by the laws of their own country?

Is it desirable that all nations should adopt a system of legislation on this subject, founded upon a uniform basis?

II.

What duration should be assigned to the proprietary rights of authors and artists in their works?

Should any difference be made, under this head, between the various classes of productions, such as literary works, musical compositions, and paintings or designs?

If these rights should extend beyond the life of the author, should any distinction be made in the period of duration according to the various classes of persons who may succeed to this kind of property, such as surviving children and other heirs, and those to whom the rights may have been transferred by purchase or otherwise?

What should be the duration of proprietary rights in a posthumous work, or one produced anonymously, or under an assumed name?

Are speeches, lectures, &c., which may be taken down in short-hand, capable of being legally recognised as the property of their authors?

Should the proprietary rights in the original text of a work be similarly extended to a translation?

Should not this depend in every case on certain conditions, such as the obligation to publish the translation within a given time?

Should any particular formalities, the neglect of which might deprive an author or artist of his proprietary rights, be required?

III.

Should the right of representing dramatic or musical works be independent of that of publication?

Would it be possible to draw a distinction between these two rights during the period of their enjoyment?

Should the composer's proprietary right in a musical composition be such as to prevent the public performance of the whole or any part of it without his permission, whatever may be the character of the work, or the mode of performing it?

Should the proprietary right in musical productions also include the exclusive privilege of making arrangements of the themes contained in them?

IV.

Should the producer of a drawing, a picture, a piece of sculpture or architecture, or, indeed, of any work of art, have the exclusive right to reproduce it or to authorise

its reproduction, either on the same or on a different scale, and either by similar or by different means to those employed for producing the original?

What means should be adopted to prevent fraudulent copies and piracy of pictures, statues, &c.

What special measures should be taken to prevent the forgery of the artist's signature to works of art?

Should proprietary rights in works of design also include any applications of them which may be made in manufactures?

Should any special formalities be necessary to secure proprietary rights in works of art which are not produced by any kind of printing or engraving?

V.

Would the Congress be prepared to recommend the adoption of the following provisions as having reference to the object has in view?

(a) The abolition of customs duties on books and works of art, or, at least, a reduction of them to the most moderate scale, and the simplification of the tariff in cases where it classifies the objects to be charged.

(b) The re-admission, duty free, when returned unsold, of works sent abroad for sale.

(c) The reduction of postal charges on printed matter.

(d) The allowing proofs with corrections to pass as printed matter in those countries where this is not now permitted.

SILK FROM VICTORIA.

The following paragraph is taken from the *Australian and New Zealand Gazette* :—

"Hopes, it appears, are entertained of a new branch of export of a rather novel character, for it is stated that a native variety of the silk worm may be found in the bush of this colony, clinging in countless swarms to the shrub which forms its food. The worm is enclosed in a dark-coloured cocoon, the exterior of which is of extraordinary toughness, and encloses a quantity of yellowish silk. The staple of this, both as regards its fineness and length, has been pronounced by a manufacturing house in Glasgow, by whom it was tested, superior to the product of the best European worms. Specimens of the silk were forwarded some time back to the Melbourne Chamber of Commerce, who, while acknowledging the donation, have apparently paid no further attention to the subject. However, as we believe it to be one of considerable importance to the colony, we hope the discovery will receive that consideration which its intrinsic merits deserve. Reliable authorities state that there is no assignable limit to the quantity of cocoons that may be gathered in a favourable locality. A box as large as a small tea-chest was filled with them in about 10 minutes; and it is calculated that two hours devoted to the work of collection would afford enough to yield 2lb. of raw silk. If this opinion be borne out by actual experiment, the employment would prove highly remunerative, for the present price of the material is nearly 15s. per lb. Mr. Whyte has gathered some cocoons, and intends shipping them to some relatives connected with the silk manufacturing trade."

M. Gerard Kreeft, dating from 14, Red Lion-street, Islington, in a letter referring to this paragraph, says:—

"1. The cocoons containing silk which have come under my observation were generally found deposited under the loose bark of *Eucalyptus rostrata*, Schl., or *Eucalyptus acuminata*, Hook, the flooded gum tree of the colonist, and are the productions of a large hairy caterpillar, from two to three inches in length, which feeds on various shrubs, and eventually selects the bark of the flooded gum tree for its transformation into the cocoon.

"I have kept one of these caterpillars in a box, and after it had spun itself in I removed the silk. The next morning the insect had surrounded itself afresh; again I

disturbed it, only to find it enclosed in a new shroud 12 hours afterwards. Specimens of the moth are at the Melbourne Museum. This caterpillar or silkworm is distributed over a large tract of country. I have found it along the banks of the Murray from Maidens Punt to the Darling junction, and about 100 miles along the bank of this river.

"Although cocoons are plentiful, I rather doubt that 'two hours devoted to the work of collection' would produce 2lb. of raw silk, and I should consider it a fair day's work to gather from 3lb. to 4lb. of cocoons, as they weigh very light indeed.

"2. There is also a silver-gray spider, with thin round body and long cherry brown legs (not hairy), spinning its meshes among the bushes of the Murray scrub, and the silk produced by this insect far surpasses in strength and glossiness the silk of the caterpillar before mentioned.

"Riding through the scrub my progress was sometimes impeded by the web of this spider, which often covered an area of several square yards, the threads being so strong that they never broke at the first attempt to push through.

"Specimens of this spider are to be found at the Melbourne Museum, as also a quantity of silk presented by Mr. Surveyor Kerr.

"Before I conclude I beg to state that my observations were made when in charge of a collecting party fitted out by the Victorian Government."

SOUTH KENSINGTON MUSEUM.

During the week ending 31st July, 1868, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,687; on Monday and Tuesday (free evenings), 3,045. On the three Students' days (admission to the public 6d.), 865; one Students' evening, Wednesday, 109. Total, 7,706.

PARLIAMENTARY REPORTS.

PRINTED SESSIONAL PAPERS.

Parl. No.

Delivered on 26th July, 1868.

- 233. Bills—Universities (Scotland)—Lords' Amendments.
- 234. ——— Judgments (Ireland) Act Amendment (amended).
- 235. ——— International Patent Right.
- 236. ——— Government of India—Lords' Amendments.
- 237. ——— Sale and Transfer of Land (Ireland)—Lords' Amendments.
- 238. ——— Leases and Sales of Settled Estates Act Amendment (1866).
- 239. ——— Administration of Oaths by Committees.

Delivered on 27th July, 1868.

- 419 (1). Metropolitan Main Drainage—Plans.
- 460. Proceedings on Private Bills—Lords' Report.
- 460. Standing Orders Revision—Report.
- 240. Bill—Government of India (No. 3) (as amended by the Lords).

Delivered on 28th and 29th July, 1868.

- 446. County Court Treasurers—Return.
- 463. Civil List Pensions—Return.
- 467. Education (Ireland)—Annual Report.
- 458. 100th Regiment—Return.
- 467. East India (Charges on Consolidated Fund)—Return.
- 441. Savings Banks—Report from Committee.
- 466. County Treasurers—Abstract of Accounts.
- 463. Foreign Shipping—Account.
- 469. Du-lin Port—Account.
- 469. Gold (Australia)—Return.
- 414. Embassy House (Paris)—Copy of Correspondence, &c.
- 163. Bills—Landlord and Tenant (Ireland).
- 169. ——— Emblements, &c. (Ireland).

Delivered on 30th July, 1868.

- 363. Billotting System—Report and Evidence.
- 407. Public Income and Expenditure—Accounts.
- 448. Naval Prize Money, &c.—Account.
- 466. British Museum—Copy of a Memorial.
- 471. Metropolitan Main Drainage—Return.
- 472. Spirits—Return.
- 241. Bill—Local Government—Lords' Amendments.

Journal of the Society of Arts.

FRIDAY, AUGUST 13, 1858.

SOCIETY OF ARTS EXAMINATIONS.

The Council have much pleasure in announcing that Mr. Thomas Ross Howard, of the Crosby Hall Evening Classes, and Mr. George Edward Skinner, of the Lympington Literary Institution, who distinguished themselves at the Society's Examinations in May last, and who had been nominated by the Council to compete for Clerkships in the Customs, have been successful in obtaining appointments. There were on this occasion four vacancies and twelve competitors, and two nominations were placed at the disposal of the Council by Lord Derby.

The following letter has been received from the Secretary to the Treasury, communicating the result of the competition:—

Treasury, S.W., 11th August, 1858.

SIR,—I have much pleasure in informing you that Mr. Thomas R. Howard and Mr. George E. Skinner have succeeded in obtaining the first and third places, respectively, in the late competition for four clerkships in the Customs; and I have written to request their attendance at this office on Friday next, when the successful candidates will decide which of the appointments they prefer to select.

I should mention that Mr. Howard is reported by the Civil Service Commissioners to have shown "marked proficiency" in all the prescribed subjects of examination.

I have the honour to be, Sir,

Your obedient servant,

WM. G. HYLTON JOLLIFFE.

P. Le Neve Foster, Esq.

NOTICE TO INSTITUTIONS.

In accordance with the resolution passed at the last Annual General Meeting of the Society, the Council will present to each Institution in Union a quarto copy of the Speeches and Addresses of H.R.H. the Prince Consort.

The Department of Science and Art have placed in the hands of the Council a number of copies of the "Introductory Addresses on the Science and Art Department and the South Kensington Museum," delivered there during the last session, and a copy of this work will also be presented to every Institution in Union.

In addition to the above, the Council have decided to present to each Institution copies of twenty-two lectures delivered before the Society of Arts, on the results of the Great Exhibition of 1851.

Institutions desiring copies of these works are requested either to apply for them at the Society's House, or to communicate to the Secretary of the Society of Arts the address of an agent in London to whom they may be sent.

EXEMPTION FROM LOCAL RATES.

It will be remembered that in June last, as mentioned in the Secretary's Report read to the Conference,* a Select Committee of the House of Commons was appointed to inquire into the operation of the law as it at present stands, by which land occupied by public establishments is rendered exempt from local rates and taxes. The Committee consisted of the following gentlemen:—Sir Francis Baring, Mr. Edward Playdell Bouverie, The O'Donoghoe, Sir James Elphinstone, Mr. Sotherton Estcourt, Mr. Hardy, Mr. Horsfall, Mr. Howard, Sir Cornewall Lewis, Mr. John Locke, Mr. Ker Seymour, Sir Frederick Smith, Mr. Wilson, Sir Charles Wood, and Mr. Eliot Yorke. As this is a question of considerable importance to the Institutions in Union, it has been thought desirable to publish the following report of this Committee:—

Your Committee commenced their inquiry "into the operation of the law as it at present stands, by which land occupied by public establishments is rendered exempt from local rates and taxes," by examining Mr. Lumley, the Assistant-Secretary to the Poor-law Board, on the state of the law respecting exemptions from rates. They next proceeded to examine witnesses locally connected with the towns of Portsmouth and Chatham; with the Greenwich Union, which includes the towns of Deptford, Greenwich, and Woolwich; with the towns of Devonport and Plymouth, and the adjoining parish of Anthony; with the parishes of Alverstoke and Rowner, on the coast of Hampshire; with the parish of Sandhurst, in the county of Berks; with the parish of St. George's, Southwark; and with the parish of St. Mary-le-Strand, Westminster. They likewise took the evidence of a member of the Town Council of Liverpool, with respect to the classes of property exempt from rates, on different grounds, in that borough.

Your Committee refer to this evidence as exhibiting the nature of the exemptions from local rates, their practical operation in the parishes where they prevail to the largest extent, the complaints to which they give rise among the ratepayers representing the unexempted property, and the remedies proposed for the removal of the additional burden which the exemptions create.

Your Committee now proceed to state the principal results of the evidence which they have received, together with the conclusions to which they have arrived upon the subject referred to their inquiry.

In order to render property rateable to the poor, under the Act of 49 Elizabeth, it is necessary that there should be an occupier, and that his occupation should be of such a nature as the law considers beneficial. The same principle applies to most of the other local rates. By "beneficial occupation," for the purposes of the law of rating, is meant an occupation from which the occupier derives either a pecuniary profit or some personal advantage or convenience.

The exemptions from the liability to local rates which arise under the existing law may be divided into two classes: 1. Exemptions created by statute, in cases where there is a beneficial occupation; 2. Exemptions on account of the non-existence of a beneficial occupation.

The most important exemptions belonging to the first class are those established by the 3 and 4 Will. 4, c. 30, which exempts all churches, chapels, and other places of religious worship from poor-rates and church-rates; and by the 6 and 7 Vict. c. 36, which exempts lands and

buildings occupied by scientific or literary societies, from county, borough, parochial and other local rates. There are likewise statutory exemptions for turnpike tolls and tollhouses, and for certain lighthouses.

The second class of exemptions, which are much more extensive in their operation than the former class, arise from the application of the legal rule, requiring, as a condition of rateability, that there should be an occupier having a beneficial occupation. As a beneficial occupation is understood to be an occupation from which some peculiar, separate, and private profit or advantage accrues or may accrue to the occupier, it follows that where lands or buildings are occupied for a public purpose, they are exempt from rate. All lands or buildings belonging to the Crown, and occupied for a national purpose, such as forts, fortifications, dockyards, arsenals, barracks, naval and military storehouses and hospitals, guardhouses, workshops, and factories for artisans employed in naval and military works, military colleges, artillery and parade grounds, government prisons, buildings used for the business of public departments, as the Treasury or the Admiralty, as well as Custom-houses, Post-offices, &c., are for this reason exempt from local rates. Official residences, likewise, where they are necessary for the discharge of the duties of the public officer, are for the same reason held to be exempt. But where property belonging to the Crown is in the possession of an occupier having a beneficial occupation, the exemption does not apply; hence the tenants of Crown lands are rateable like tenants of lands belonging to private owners; the rangers of the Royal parks are rateable for their residences; and it has even been held that the inmates of Hampton Court Palace are subject to the rate, notwithstanding the precarious nature of their tenure. For a similar reason, buildings and lands occupied by municipal or other public bodies for a public purpose, such as county and borough gaols, judge's lodgings, court-houses, police stations, are within the exemption. Public roads and bridges are likewise exempt, though canals, railways, and other means of communication yielding a return to a company of proprietors, for their own advantage, are rateable.

The County Lunatic Asylum Acts render a county lunatic asylum rateable, according to the value of the land, as it was at the time of the purchase or acquisition. A similar rule applies to Burial grounds under burial Boards. With regard to workhouses belonging to a union under the Poor Law Amendment Act, it has been decided by the Court of Queen's Bench, in the case of *The Queen v. Wallingford Union*, that they are not within the exemption applicable to buildings occupied for a public purpose.

It may be remarked that in some of the cases of buildings and lands used for a public purpose, such as parish highways or barracks, it is difficult even to determine who is the occupier, independently of the question of beneficial occupation.

The rule respecting the exemption of property occupied for a public purpose has been held to extend to charitable institutions maintained by a private endowment, such as hospitals, free schools, and other similar establishments. In these cases, neither the trustees who receive and apply the endowment, nor the objects of the charity who profit by its application, are considered as having such a beneficial occupation as renders them liable to be rated. It is not easy to understand the grounds upon which charitable institutions maintained by a private endowment have been brought within the benefit of the rule, which applies to institutions maintained out of public funds for a public purpose.

A third but limited head of exemption, not included in either of the above classes, is that which arises from the prerogative and the political status of the Sovereign. All lands and buildings in the personal occupation of the Sovereign are exempt from local rates; hence, not only the Royal palaces personally occupied by Her Ma-

jesty, but the Royal parks and pleasure grounds, enjoy an immunity from local taxation.

As parochial rates are assessed upon a limited district, any exemption which withdraws a portion of property from the rateable fund operates as a sensible detriment to the other ratepayers, because it increases the common burden, whatever may be the amount of the expenditure. In parishes where a single post-office, or hospital, or scientific institute is withdrawn from the entire assessment, the exemption may not be of much practical importance; but where, as in the seats of the great naval and military establishments of the government, large portions of a parish are abstracted from the common rateable fund, the consequences to the ratepayers are serious. Thus the poor-rate assessment of the parish of Portsmouth is £24,183, and the annual amount levied as poor-rate and borough-rate is 6s. in the pound;* but the exempted property in the parish, occupied by the government for national purposes, is estimated at an annual value of £8,000. This sum is equal to one-third of the existing assessment; and, if it were added to that assessment, the poundage rate required to produce an equal sum would be one quarter less; that is to say, instead of a rate of 6s., a rate of 4s. 6d. in the pound would be levied. The assessment of the parish of Portsea is £151,179, and the same rates are 4s. 8d. in the pound. Since 1845, property assessed at £1,077 has been thrown into the dockyard, or otherwise rendered exempt; one-seventh of the parish is stated to be occupied by the government, and not to be assessed to the poor-rate.

Examples of the same state of things occur in other towns where large government establishments exist. Thus, in the parish of Chatham, the assessment is £87,063, upon which the county and poor-rates are now 4s. 10d. in the pound; more than 100 acres, containing barracks, hospitals, a fort, a gun wharf, and a dockyard are occupied by the government, and withdrawn from the parochial rates. In the parish of Greenwich the assessment is about £130,000; and the county and poor-rates are 4s. 4d. in the pound. It contains the large public establishment of Greenwich Hospital, which is exempt from rates. Greenwich Park is likewise exempt, as being in the occupation of the Crown. In the parish of Woolwich the assessment is about £60,000 upon a low valuation, and the rates are now about 4s. 8d. in the pound. In this parish about two-thirds of the frontage on the south bank of the river, is occupied by the government for a dockyard and arsenal, and the land and buildings thus employed contribute nothing to the local taxation. The town of Deptford lies in two parishes, St. Nicholas and St. Paul's, which were formerly one parish and were separated by a Local Act. In St. Nicholas the assessment is about £13,000, upon a low valuation; the county and poor-rates are now 10s. in the pound; besides which there are rates for sewerage, paving, and lighting to the amount of 2s. in the pound; making altogether 12s. in the pound. The assessment of St. Paul's is about £100,000; and the county and poor-rates amount to about 8s. 6d. in the pound. The parish of St. Nicholas comprises between 70 and 80 acres of land, of which about two-fifths are occupied by government establishments, as slips for shipbuilding, storehouses, dry and wet docks and official residences. St. Paul's includes the victualling yard and a small portion of the dockyard.

Similar effects are produced by the large government establishments at Devonport. The assessment of the parish of Stoke Damerel or Devonport is £62,919, and the average annual rate for the last five years is 7s. 1½d. in the pound. This amount includes all the rates levied in the parish. In the neighbouring parish of East Stoverhouse the assessment is £23,037, and the rates are 4s. 10d. in the pound. In the two parishes of Plymouth the assessment is £112,465, and the rates are about 6s. 10d.

* The statements of assessments and poundage rate in the report refer to periods of a year.

parishes the land occupied
withdrawn from the
proportions to the rest of

of 1,815 acres.
out of 176 acres.
out of 1,635 acres.

Devonport is occupied
steam-yards, powder works, and
purposes, and partly for bar-
and fortifications. The parish
Marine Barracks, the Vic-
Hospital.

Antony, near Devonport, the War
recently purchased land, assessed at
of the parish being £7,640.
devoted to a public pur-
from the rateable property of
rates in this parish are now about

the principle is further illustrated
Stoke, and by the neighbouring
the coast of Hampshire. The
parish of Alverstoke, including the
wards of £29,000, upon which the
of the last five years is 4s. 6d. in
and county, besides a paving rate
and a highway rate in the rural
of 4d. to 6d. in the pound. The total
parish amounts to 4,077 acres; of
26 acres, being two-fifths of the whole,
the Admiralty and War Department as
a Victualling establishment, a maga-
and shot, fortifications, gunboat slips
in the parish of Rowner, the War Depart-
purchased 395 out of 1,195 acres for
fortifications. The assessment of the
£1,340; the land subtracted from the
by the government is assessed at £462,
a third part; the present rates are only

of Sandhurst, in Berkshire, which con-
an area of 425 acres is occupied by the
The assessment of the entire parish
the county and poor-rates are about 2s. 6d. in
to the present time; the land and build-
by the College have been included in the
and have contributed to the parish rates;
has been given to the parish officers that the
will henceforth be claimed; and as the assess-
land occupied by the College amounts to
the whole, the burdens of the other rate-
be increased by one-sixth. The same parish
contains two other institutions exempt from
namely, Wellington College, and a Government
asylum.

class of exemptions is exemplified by the
St. George's, Southwark. The assessment of
is £120,500, upon which the rates now amount
in the pound. It contains several institutions
exempt under the general law, namely,
Hospital, the House of Occupation, the Blind
the Deaf and Dumb Schools, the Magdalen, the
Schools, and the Post Office. The annual
value of the exempted property in this parish is
John Day, the assistant-overseer, at
is equal to one-sixth of the existing

Liverpool furnishes instances of exemp-
classes. The valuation of the
and the rates are about 4s. in the
exempt from rate consists of three
property, consisting of
machines, public baths and wash-
library, the observatory, the

town hall, with the various public offices, the exhibition
rooms for the academy of art, the public health offices,
the office for weights and measures, the house occupied
as the judge's lodgings, St. George's Hall, with its appur-
tenances, the waterworks for the purpose of supplying the
town with water, and various yards, sheds, count-
ing-houses, and workshops, for the purposes of arti-
ficers connected with the estate. Secondly, buildings
occupied by the government, namely, the Custom House,
the Excise Office, the Post Office, the barracks, and the
recruiting establishment. Thirdly, the property occupied
by the Mersey Dock and Harbour Board. The
aggregate rateable value of these three classes of property,
now exempt from the rate, was stated to your Committee,
by Mr. Picton, a member of the Town Council of Liver-
pool, and an architect and surveyor, to amount to
£183,539 in the parish of Liverpool, and £36,280 in the
parish of Toxteth-park, both being within the borough
of Liverpool. If the whole of this property were brought
into the rate at Mr. Picton's assessment, it would diminish
the burdens of the present ratepayers of the parish of
Liverpool by about one-sixth, or 8d. in the pound, except
so far as the additional borough rate, which would be
increased by a corresponding amount, should fall upon
the same ratepayers.

Some of the public buildings and institutions entitled
to exemption are detrimental to the ratepayers only by
diminishing the rateable fund of the parish. Such, for
example, are offices belonging to public departments,
town-halls, court-houses, hospitals, museums, and forti-
fications. Some government establishments, however,
not only operate as detractions from the rateable property,
but by their indirect effects add to the burden of pau-
perism, or further diminish the productiveness of the
rates. Thus, in the Portsmouth Union, the charge on
account of the wives and children of soldiers, sailors, and
marines, and of sailors and soldiers, whom the govern-
ment establishments bring to this spot, was £2,446, out
of £23,461 expended in the relief of the poor during the
last year. One-fourth of the pauperism of Chatham
parish is estimated to arise from the widows and child-
ren of soldiers, and of government artisans and labourers,
who are drawn to it by the public establishments. In
this parish likewise a sum of nearly £1,200 a year is ex-
cused to occupiers of small tenements, of whom about
two-thirds are married soldiers, marines, and sailors, or
labourers in Her Majesty's yard. Mr. Saw, clerk of the
Greenwich Union, on a recent inspection of the union
workhouse, ascertained that out of 455 adult female in-
mates, 199, or 44 per cent., had been connected with the
government establishments: he thinks that this ratio
would apply to the out-door poor in the parish in Wool-
wich, but would be too high for the other parishes of the
Greenwich Union. Mr. Ryder, Vice-chairman of the
Commissioners of Devonport, thinks that, at the lowest
estimate, three-tenths of its pauperism is due to the
government establishments in the parish, and to the
maintenance of wives and widows of sailors: he states
that nearly one-half of the widows and children receiving
relief are the widows and children of persons directly
connected with the dockyard.

A similar effect is produced in Alverstoke. In this
parish the amount paid in out-door relief for the main-
tenance of the wives and families of sailors and marines
amounts, upon the average of the last four years to
£151 per annum, being one-tenth of the whole of the
out-door relief paid in the parish. Other expenses are
likewise produced by the persons discharged from Haslar
Hospital. The cost of the legal relief of the poor in this
parish has increased from £4,125 for the parochial year
1854, to £6,326 for the parochial year 1858. The Rev.
Mr. Walpole, incumbent of the parish, states that, during
the last five or six years, the rather large sums distri-
buted as alms by him, or under his direction, have to
the extent of three-fourths of their amount, been
to persons who had been brought into the pa-

public works, and had become ill, or to their wives and families whom they had deserted. In the neighbouring parish of Bownar the cost of the relief of the poor has hitherto been trifling; but it is anticipated by a local witness that the purchase by the War Department of 395 out of 1,195 acres may derange the balance of labour and population, and reduce a portion of the labouring families to pauperism. It is feared likewise that a similar purchase in the parish of Antony, near Devonport, will increase the charges upon the poor-rate.

It might be supposed that the seaports and other places containing large Government establishments for military and naval purposes would be compensated by the Government expenditure, and the stimulus which it gives to labour and retail trade, for the diminution of the local taxation, and the increase of the charge for the relief of the poor. There is no doubt that when such establishments have once been created, and the habits of the population have been adapted to their existence, their sudden suppression would be productive of serious local inconvenience, and would be regarded as an evil by the inhabitants. But the evidence received by your Committee proves that the places where those establishments exist would probably have enjoyed greater prosperity if they had never been created, and would have derived more advantage from the development of their commercial resources than they have derived from the local Government expenditure. Fortifications, dockyards, and other naval and military establishments are inconsistent with the enterprise of private trade, and the Government steadily interferes to prevent the construction of any works in the neighbourhood. Thus, at Portsmouth, improvements of the town and a new line of rail have been stopped by the Government on this account. Mr. Stigant, who has been three times mayor of Portsmouth, says: "We have made several attempts to obtain mercantile docks in the neighbourhood, and proposed several localities to the Government authorities for their consent, but we have been universally refused, they saying that they can never consent to docks or any matter of that sort being within the borough of Portsmouth, consequently we are excluded from speculation or improvement in mercantile affairs. We are obliged to depend wholly and solely upon the Government establishments for our position. There is a very strong feeling among a large number of the inhabitants that the harbour of Portsmouth would be very quickly rendered a mercantile harbour of the first character in the kingdom if we could only have access to it." "When I was mayor (he adds), the town council was applied to by steam companies for accommodation in Portsmouth, and we were obliged to refuse it."

Mr. Woolcombe, who has been town clerk of Devonport for nearly twenty years, states "that since his knowledge of the place, there has never been a single attempt to carry out anything which required facilities as regards water communication, which has not been objected to." "I do not mean to say (he adds), improperly objected to, but which has not been objected to by the Admiralty, on the ground that it was an interference with the Government water, which could not be sanctioned." The same witness further expresses an opinion that if there had been no Government interferences at Devonport, the large docks in connexion with the Great Western Railway which have recently been established in Mill Bay, in Plymouth, would have been established in the dockyard of Devonport and the Keyham Steam Yard. He states, moreover, that the Post-office packets for the Cape of Good Hope were recently removed from Devonport to Mill Bay in consequence of objections made by the Admiralty.

An application, some years ago, was made to the Admiralty for permission to construct commercial docks at Haalar Lake, near Gosport, in the parish of Alverstoke. The application of the dockyard reported in favour of the application was refused; the space is

now occupied by the gun-boat slips; and having formerly been liable to pay parish and county rates, is now exempt from that liability. The Rev. Mr. Wulpole, the incumbent of Alverstoke, expresses a strong opinion as to the economical evils brought upon the parish by the Government establishments; he believes that not only has its commercial development been prevented, but also the formation of a watering-place on the coast been rendered impossible by the Government occupation.

It has been represented by the witnesses, that owing to the existence of Government establishments, and the character of the population which they attract, the value of property is in some cases diminished. It is stated that rents in Chatham, particularly rents of houses, are lower than in any town in Kent; and that in Devonport the value of houses has for a series of years been diminishing, while in Plymouth, where there are no Government establishments, it has been increasing. At the beginning of the century the population of Devonport was 23,747, and the number of its houses 2,352, at the same time the population of Plymouth was 16,040, and the number of its houses 1,782. According to the census of 1851, the numbers stood as follows:—

	Population.	Houses.
Devonport.....	37,338	4,027
Plymouth.....	51,281	5,535

So that in the last 50 years Plymouth has more than trebled its population and the number of its houses; whereas Devonport has not doubled either its population or the number of its houses. The comparative progress of these towns is attributed by Mr. Woolcombe to the influence of the Government establishments in the one from which the other has been free.

The remedy for the evils experienced in the place where extensive exemptions prevail, which has been proposed by the witnesses to your Committee, is that the exemptions, particularly those relating to property occupied for national purposes, should be abolished, and that property of this class should be assessed and rated like other property.

Your Committee think it right to add, that the Com of Queen's Bench has, of late years, while it gave effect to the existing law, expressed an opinion that exemptions which withdraw a part of the property of the ratepayers from the rate, and thereby increase the proportionate burdens of the other ratepayers, are inequitable.*

In recognizing the reasonableness of the demand for an alteration of the existing law of rating, with respect to exemptions, your Committee would, in the first place remark that the personal immunity of the Sovereign rests on constitutional grounds, which are not limited by the law of rating, and which have never been brought in question. The property of the Crown, when in the beneficial occupation of a subject, is at present rateable.

Your Committee think it desirable that the exemption for religious buildings, conferred by the Act of 3 & 4 Will. 4, c. 30, and that for burial grounds under burial boards should be maintained. They are likewise of opinion that the exemptions now enjoyed by turnpike tolls and tollhouses, as well as by parish highways, and by county and other public bridges, should continue.

With these reservations they recommend that all lands and buildings used and occupied for public, charitable, scholastic, or scientific purposes, whether there be a beneficial occupation or not, according to the received meaning of that term, should be assessed to the local rates, and should pay rates accordingly.

The practical difficulties which stand in the way of this important alteration in the law of rating, are limited

* See Queen v. Sterry, 12 Adolphus and Ellis, 84. Scott v. St. Martin-in-the-Fields, 5 Ellis and Blackburn, 568. Smith v. Birmingham, 7 Ellis and Blackburn, 483.

is fixed for them, in the union acquiesce, and be of such a character as to have any assignable value. It is no doubt whether similar to the one hand, and the other should be determined in an equitable manner. They therefore recommend that the rates being fixed by the parish vestry, at the property and quarter sessions, the Court of Queen's Bench, each of the two sessions, should appoint an arbitrator, and the arbitrators should appoint an arbitrator to decide in case the arbitrators should be unable to do so. The decision should be final.

It is suggested that the law should fix a liability on some definite parties, such as the Admiralty, the Secretary of State, the Postmaster-general, the county council of a borough. In the case of the county council, provision would have to be made by the county council; in the case of counties and boroughs, the parochial rate would be paid from the borough rates. (See 4 & 5 Vict. c. 48.)

It is suggested that the remedy afforded by the present law, in the case of distress and sale of the defaulter's goods, and in default of sufficient distress, is not applicable to the case of persons in public situations, paying rates out of a public fund.

It will be observed that unless the alleviation of the rates payable should produce any laxity in the administration of the rates, the abolition of exemptions would lead to no increase of expenditure, and would only effect a change in the distribution of existing burdens. It would diffuse over a wider area a charge now concentrated upon a small district.

The case of the Dock Trust of Liverpool appears to your Committee to depend exclusively upon the peculiar provisions of the Private Act, by which the appropriation of the revenues of that trust is governed, and upon the construction of those provisions by the Court of Queen's Bench. It is wholly independent of the general law, under which the property, now exempt, would be rateable. If any injustice be created by the operation of the existing Private Act, it ought, in the opinion of your Committee, to be rectified by similar legislation. Your Committee will only remark that the general objections to the exemption of property, already adverted to, extend to the case of the Liverpool Docks; while the present law of rating can be applied to it without difficulty, there being a beneficial occupation, and a large revenue from which the rates could be paid.

Your Committee think it right to add, that many other exemptions from rates are created by Local Acts, into which they have made no inquiry, and which they have not taken into their consideration in making the preceding recommendations.

From the evidence brought before your Committee, it appears that some of the departments of the Government have recently taken steps for insisting on the exemption of property occupied by the Government, in cases where the parish rates had been previously paid by the department.* As this extension of the exemption of Government property is contrary to the views expressed by your Committee, and occasions local irritation, they suggest that the Government should consider the expediency of suspending their proceedings until Parliament may have before them the Evidence and Report of your Committee, and may have come to some decision on the question.

It is suggested by which the present determination there is no assignable value in the market. It is suggested that the

ATLANTIC TELEGRAPH.

Her Majesty's ship *Agamemnon* arrived at Valentia on Thursday morning, the 5th August, with the end of the telegraphic cable, the communication between Ireland and Newfoundland being complete. From the time the *Agamemnon* left Queenstown, on the 18th of July, until she joined the rest of the squadron at the rendezvous in mid-ocean, on the 29th, she experienced a continued succession of heavy winds. The splice was successfully made on the afternoon of the 29th of July, and the ships started towards their several stations. On the evening of the same day, a breach of continuity occurred in the current, which lasted one hour and a-half. The ship was stopped, and the machinery repaired, though not till hopes of holding on the cable had been abandoned. During Friday, it blew a head gale of wind, against which the ship, under her full steam, could hardly make way, even with yards and top-masts struck. On Saturday, the 31st, the wind shifted round to the south-west, and during that day, Sunday, Monday, and Tuesday, it continued to blow hard, with frequent violent squalls, the sea running tremendously high the whole time, and no one expected the cable to hold on from one minute to the other. On Wednesday, the weather moderated, but the swell was still high. About 4 a.m. the change from the lower to the upper coil was successfully made, and during the afternoon shallow water was gained. The second change from the upper to the orlop deck coil was made about 9 o'clock in the evening. At 10 o'clock at night, shoal water of 250 fathoms was reached, after which all went well until the ship anchored in Dowlas Bay, at 6 o'clock on Thursday morning. Soon after the ship's arrival, a signal was received from the *Niagara* that she was preparing to land, having paid out 1,030 nautical miles of cable, while the *Agamemnon* had accomplished her portion of the distance with an expenditure of 1,020 miles, making a total of 2,050 miles. At 3 o'clock in the afternoon the end of the cable was brought on shore, placed in the trench dug for its reception, and put in connection with the galvanometer. Some delay necessarily occurred in setting up the telegraphic instruments taken out by the *Niagara* to Newfoundland. On Monday night, the 9th instant, at 11.15, Newfoundland commenced the use and adjustment of the instruments, and words were telegraphed for the first time. The speed at which the letters came is said to be faster than when the experiments were made at Keyham, previous to laying the cable.

OVERHOUSE TELEGRAPHS.

In a communication printed in the *Journal*, p. 85 of the present volume, Mr. Sydney H. Waterlow called attention to this subject, pointing out the importance of ready telegraphic communication between the numerous police and fire establishments in the metropolis, and advocating the adoption of a system of telegraphic wires for this purpose carried over the tops of the houses. At the date of that communication—December, 1857—Mr. Waterlow had already formed a telegraphic connection between the business premises of the firm to which he belongs, situated in Birch-in-lane and London-wall, and the firm have extended the system to their establishment in Parliament-street, so that their three places of business are now in direct speaking communication with each other. It is unnecessary to point out the advantages the system affords in a commercial aspect. Time and labour are necessarily to a great extent economised, and the question then arises, at what cost is this accomplished? Mr. Waterlow, at the request of the Secretary, has furnished the Society with information as to details of construction and cost, from which this statement is drawn up.

The line of wires (double) commences at London-

wall, proceeding direct to Birch-in-lane, and reported at different intervals, terminating at the street. The distances and intervals are as follows:—

1. From London-wall to Birch-in-lane
2. Birch-in-lane to Sterry's, in Cannon-street
3. Sterry's to Calvert's Brewery, Upper Thames-street
4. Calvert's to Red Lion Wharf, Upper Thames-street
5. Red Lion Wharf to Maidstone Wharf, Queenhithe
6. Maidstone Wharf to Trigg Wharf, Upper Thames-street
7. Trigg Wharf to Ponsford's City Mills
8. City Mills, crossing the river, to Glass Wharf, house (Surrey side)
9. Glass Warehouse to White's Iron Wharf
10. White's to Burr's Shot Tower
11. Shot Tower to Goding's Brewery
12. Brewery to Maudslay's
13. Maudslay's, crossing the river, to Parliament-street

The wires are supported on poles fixed to the houses at such convenient distances as are readily obtainable, and Mr. Waterlow has, for this purpose, used a kind of saddle, in cast iron, carrying into which the supporting pole is fixed. The pole is on the ridge of the house and is held in its place by screws into the ridge tree and four into the wall. The pole is kept steady and firm by means of wires from its extremity to the roof. No injury is ever done to the house by the fixing of the poles. Six screws only are used, and when removed, all that is to be done is to fill up and make good the holes whence they are withdrawn. The Telegraph wires are No. 14 gauge and are of steel, but lighter than common bell wire, thus combining strength and lightness. It might have been imagined that some difficulty would occur in obtaining the assent of the proprietors of house property over which the wires are to pass, but Mr. Waterlow has rarely met with any difficulty from them; on the contrary, with some unimportant exceptions, has received every facility for carrying his object into effect. With the exception of a very few cases where there were joint or other interests, cases which could not readily give complete assent, and it was easier to take the consent of the owners of the next house, Mr. Waterlow has scarcely in any instance had to deviate from the line first proposed. In every case a written agreement is entered into to support the supports and wires at a short notice if required, making good any damage which may have occurred. Mr. Waterlow states the cost to be at the rate of 10s. per mile, including poles, wires (double line), insulating labour, and everything, except the instrument itself, whole fixed and painted with three coats of paint.

Mr. Waterlow has adopted a very novel and ingenious mode by which the wires can be painted and the renewal, when required, without stopping the communication. The cost of painting a double line of wire when necessary is about £4 a mile.

The telegraph used by Messrs. Waterlow is a single-needle instrument, requiring only a single line of wire; the double line is put up, in case it may be after found necessary or desirable for any reason to use of it, the extra cost of stretching a second line being the same time as the first being comparatively small. The cost of a single-needle instrument is £5; alarms, 4s. each.

Mr. Waterlow calculates that the whole of the police stations and fire-engine establishments in the metropolis might be brought into communication with each other for an outlay not exceeding £5,000. The importance of such a rapid communication can scarcely be

amount spent at present in communicating by telegraph, a distance of 100 miles, the outlay of £5,000. When Mr. ... proposed connecting the Birchington and ... establishments by telegraph, a distance of ... and an estimate prepared of the cost of ... wires for the purpose. The ... by the method adopted the cost ... of instruments.

REPORT FROM BEETROOT.

Report of the Commissioners of Inland Revenue to Parliament last year, the Commission to this subject say:—

An important matter connected with the ... which has engaged our attention in the ... year, is the attempted introduction into ... process of distillation from beetroot, ... to have been adopted to some extent in ... nature of the process is such, that our pre- ... do not admit of its being carried into ... on learning that some persons interested ... try an experiment with it on a large scale ... in Kent, we conceived it to be our duty ... or impediment to their proceedings. ... therefore, allowed full liberty of action to these ... distillers, but have stationed some careful ... works, and have received from them con- ... explaining in detail the method of working, ... incidents to it, together with exact accounts ... which have been obtained.

We have not hitherto been such as to lead to the ... process can be used with profit as a mode ... curing spirits. It is, however, asserted by ... have introduced it, that the manufacture of ... by a subsidiary object of the invention, and ... of the spirits, when rectified, will be suffi- ... the expenses of manufacture and of mate- ... that the beetroot from which it has been made ... be used for feeding cattle, improved for that ... the process which it has undergone, and a ... of profit to the farmer. For it is to the ... at this invention is offered as a valuable addi- ... agricultural operations; and if it can be estab- ... a fact that it is so, it will become a matter of ... consideration whether the Distillery Laws can be ... as to allow the manufacture of spirits in the ... proposed, without danger to the great revenue ... present derived from that article."

The Commissioners, in their second report presented ... this year carry on the subject as follows:— ... account was given in our first report of the ... ment of an experimental beet-root distillery. ... ults obtained were very unsatisfactory, and did ... us to anticipate any further attempts of the ... nature; but Messrs Dray, who made the apparatus, ... licensed by the patentee of the process, repre- ... to us so strongly the necessity of giving a fair ... to their experiment, by trying it on a large ... and with the produce of various qualities of ... that we obtained your lordship's leave (not with- ... first ascertaining that the licensed distillers would ... no objection), to permit the erection of 12 ... imental beet-root distilleries in different parts of ... United Kingdom, the selection of places and of ... ons being left to Messrs. Dray. Only 10 of these ... leries have been in operation, but as none of them ... succeeded in producing a saleable spirit, or spirit of ... kind in sufficient quantity per ton of root to pay ... working expenses according to the calculation of ... projectors, it may fairly be assumed that the process ... never be successfully adopted in this country. The ... errations of our officers on the results obtained at each ... ce will be found in detail in the appendix; and it may

therefore be sufficient to state here that one of the most enterprising of these experimentalists has recently applied to the Chancellor of the Exchequer for protection against the grain distiller, in the shape of a differential duty of 2s. 6d. in his favour, and has acknowledged that, without some such advantage, it would be impossible for him to make a profit, or even to pay the working expenses of the distillery."

The following is an account of the roots used and spirits produced at the experimental distilleries:—

Where situated.	No. of Weeks at Work.	Globe Mangold and Silesian Beet.	Galls of Proof Spirit charged with Duty.	Average Number of Gallons per Ton	Spirits Sold.
Ruddington (Notte)	9	Tons Cwt. Qrs.	4,631	8.9	Gallons, 267
Lincoln	16	517 5 0	5,710	9.5	None
Louth (Lincolnshire)	6	600 4 0	4,692	5.5	None
Laxton (Yorkshire)	12	835 0 0	3,435	8.9	None
Fineshade (Northampton) ...	13	396 12 0	4,201	8.1	57½
Bolney (Sussex)	10	516 0 0	2,074	6.6	None
Miney (Wilts)	10	313 0 0	7,003	9.2	None
Crowmarsh (Oxon)	12	758 10 0	1,260	6.0	None
Reading (Berks)	18	207 0 0	4,395	9.5	534
Orford (Kent)	14	460 0 0	1,782	7.9	None
North-end (Middlesex), } near Fulham	3	224 0 0	487	6.9	None

Messrs. Ridley and Co., of 27, Crutched Friars, in a letter to the *Times* on this subject, say:—

"It is much to be regretted that some misconceptions prevail respecting the properties of beetroot to yield a fine consumable spirit. In France, during the last three years, millions of gallons have been distilled from this cereal, converted into and freely consumed as Cognac brandy. So far this tends to demonstrate its superiority over grain for spirit-making purposes.

"Beetroot contains from 10 to 12 per cent. of solid saccharine matter, which when, disengaged by maceration and distilled in the ordinary manner, will yield in good seasons 25 gallons of proof spirit from one ton of root. It can be cultivated at a cost of 10s. per ton, and, allowing its value to be augmented to 20s. or even 30s. per ton, when used for distilling purposes, a very handsome profit might be obtained by selling its spirit at 2s. per gallon; besides which the pulp of the root, after being denuded of its saccharine, is in no way deteriorated as cattle-feed; on the contrary, some authorities assert that, being partially cooked, it is then more nutritious.

"Our Inland Revenue laws, in many instances, are found to operate obnoxiously against native enterprise. Why not allow our farmers freely to distil their produce and apply the refuse to fatten cattle, as is the common order of things on the Continent, particularly in Germany? A new field might easily be opened for the cultivation of beetroot, on lands now lying waste, which could be profitably turned to account,—i. e. to provide spirit for man and food for beasts, while the highly cultivated grain lands could be more exclusively devoted to their legitimate purpose of raising breadstuffs for the actual wants of our enormous community. We fear, however, that while the Inland Revenue officials evince affection for class interests, the projectors of beetroot distilleries may expect to meet no end of obstacles, created, to a great extent unnecessarily by excisemen to balk the developments of new projects before obtaining a fair trial."

COTTON SUPPLY FROM AFRICA.

A meeting of the Cotton Supply Association was held in the Manchester Town-hall, on Friday, August 6th, Mr. J. Cheetham, M.P., in the chair, to receive information from Mr. Campbell, her Majesty's Consul as to the prospects of cotton supply from the East of Africa. He gave a most encouraging ac-

ATLANTIC TELEGRAPH.

Her Majesty's ship *Agamemnon* arrived at V. Thursday morning, the 5th August, with the telegraphic cable, the communication between land and Newfoundland being complete. At the time the *Agamemnon* left Queenstown, on the 29th of July, until she joined the rest of the squadron at sea, she experienced a succession of heavy winds. The splice was fully made on the afternoon of the 29th of July, and the ships started towards their several stations. In the evening of the same day, a breach of continuity in the current, which lasted one hour and a half, the ship was stopped, and the machinery repaired, not till hopes of holding on the cable had been abandoned. During Friday, it blew a head wind against which the ship, under her full steam, could make way, even with yards and top-masts set. On Saturday, the 31st, the wind shifted round to the west, and during that day, Sunday, Monday, and Tuesday, it continued to blow hard, with frequent squalls, the sea running tremendously high. At this time, and no one expected the cable to last more than one minute to the other. On Wednesday, the 1st, the wind moderated, but the swell was still high. On Thursday, the change from the lower to the upper current was successfully made, and during the afternoon water was gained. The second change from the orlop deck coil was made about 9 o'clock in the evening. At 10 o'clock at night, about 1,000 fathoms was reached, after which all went well. The ship anchored in Dowlas Bay, at 5 o'clock on the 2nd day morning. Soon after the ship's arrival, a message was received from the *Niagara* that she was at St. John's, having paid out 1,030 nautical miles, while the *Agamemnon* had accomplished the same distance with an expenditure of 1,030 fathoms, a total of 2,050 miles. At 3 o'clock in the afternoon, the end of the cable was brought on shore, and a trench dug for its reception, and put in place. The galvanometer. Some delay was occasioned by setting up the telegraphic instruments, and the *Niagara* to Newfoundland. On Monday, the 3rd instant, at 11.15, Newfoundland commenced the adjustment of the instruments, and the communication was graphed for the first time. The speed of the letters came is said to be faster than the previous experiments were made at Keyham, previous to the laying of the cable.

OVERHOUSE TELEGRAPH.

In a communication printed in the present volume, Mr. Sydney B. has drawn attention to this subject, pointing out the necessity of ready telegraphic communication between the police and fire establishments in London, and advocating the adoption of a system for this purpose carried over the telegraph. The date of that communication was the 1st of August. Waterlow had already formed a system of communication between the business premises of the City, situated in Birchington, and the firm have extended the system to the establishment in Parliament-street, and the communication of business are now in direct communication with each other. It is pointed out the advantages the system offers in every aspect. Time and labour are saved, and the cost is this accomplished? Mr. B. has furnished the Secretary, has furnished the information as to details of the system, and this statement is drawn from the statement.

The line of wire

resources of the districts near the mouth of the Niger, especially as bearing on the objects of the association, and he believed there was every prospect of obtaining thence a large supply of cotton in course of time. This was not the only part of the country from which it might be procured, for cotton actually grew throughout the whole of tropical Africa. When our forefathers clothed themselves in sheepskins and goatskins, the ancestors of the people in that region were clothed as they are now. But the Bight of Benin had been occupied by the slave trade for nearly a century, and by its operation the resources of the country had been shut up. Since the Government had taken the matter in hand, and sent him there in order that British interests might have fair play against the slave-trade, great progress had been made. The palm-oil trade from the Bight of Benin had increased during the last six years by about £600,000 out of £1,000,000. Why should not a cotton trade receive equal development if this country supplied capital for the purchase and skill for the preparation of that important product? The first ship loaded with cotton would give the signal for the whole of the cotton regions of Africa. The people were exceedingly fond of agriculture. In Abeokuta they preferred working in the plantations for 3d. a-day to working at any other employment for 9d. But, hitherto, they had been shut out from communication with civilised countries, and their roads were, at present, mere pathways. He believed the Niger would become the Mississippi of Africa as its trade became developed. At present the cotton from that region had been obtained from Abeokuta only. It was a peculiar feature of this part of Africa that it contained towns of 40,000, 60,000, 80,000, 100,000, and even 120,000 inhabitants, while in other parts there were only scattered villages. The people were not merely growers, but manufacturers of cotton, and from Lagos and the Bight of Benin 200,000 cotton cloths of native manufacture, averaging 24lb. each in weight, had been exported in the year 1857 to the Brazils or elsewhere. The shipment of cotton from Lagos in 1856 was 34,491 lb., and in 1857 it was 114,844 lb. Small as these beginnings were, it was remarkable how they were progressing. Besides the export, the people supplied their neighbours with at least 200,000 heavy cloths, weighing 4½ or 5lb. each. All this commerce had been established before we had begun to trade with them. He looked forward to our buying the cotton from the natives and their purchasing from us the manufactured article, which we could supply so much cheaper. There was nothing to fear on the score of security to property; Europeans were everywhere received with kindness, and cotton was found exposed for sale in every town at the weekly markets. It might, therefore, be said that it was going a-begging for want of purchasers. What was wanted by the growers and traders was the cheap and rapid means of cleaning the cotton. There was no foundation for the prevailing belief that the free African would not work if he were secured the fruits of his labour. At Lagos the people went to work at day-break, they took their meals and rest in the heat of the day, and a more industrious people he believed did not exist. He had mentioned the value of labour at Abeokuta, but in other towns it was only 2d. a-day, or 1½d. a-day in the interior. He estimated the population at a million and a-half, and they were all clothed in garments of their own manufacture. He was confident that 4½ lb. of cotton as the cotton consumption of each person, was a very low estimate. In the question of the cotton supply to England, it must be remembered that in Africa there was no rent to pay for the land. After referring to the importance of the cultivation of this part of Africa, and to the advantages it possessed as regards cotton, Mr. Campbell concluded by saying that the lands had yet been cleared exclusively for the cotton trade. Mr. Campbell concluded by saying that the cultivation of cotton in the

sending a respectable man as superintending agent at Abeokuta, with a supply of small presses, gins, an iron store, iron canoes to convey cotton bales between Abeokuta and Lagos, &c. The agent should carry with him £2,500 or £3,000 in suitable merchandise for the purchase of cotton. He should be authorised to buy on the spot from time to time, as wanted, cowrie shells to the value of £250, those being the currency of the country. They were to be had at Lagos at from £22 to £23 the ton. The London and Liverpool market might be tried. The cheap blue shell cowries from Zanzibar were what was required, but care should be taken in selecting them, as, being bought by weight and sold by number, the smaller size shell would be the most profitable. The agent should be authorised to hire native sub-agents for the interior towns, men of good character, and as these did not abound, their services were now valued at from £60 to £80 per annum, they providing for themselves. The agent should be supplied with an iron house, lined inside with board, raised on iron pillars at least 12 feet high. This elevation was essential to health. Mr. Campbell having given satisfactory replies to several questions,

Sir J. POTTER, M.P., moved a resolution that the association, with the support of the trade, should endeavour promptly and practically to realise all the great advantages thus perceptibly offered for the important increase in the supply of the raw material which was much needed.

Mr. HADFIELD, M.P., seconded the resolution, which was unanimously agreed to.

Mr. BOOKER, of Liverpool, and Mr. HENRY ASH, afterwards addressed the meeting, and a resolution of thanks to Mr. Campbell was adopted.

STEAM CARRIAGES ON COMMENCEMENT

The following account, taken from the *Herald*, is communicated by Mr. Campbell, of New York:—

"Many of our readers have doubtless seen a steam carriage which has been introduced into New York and vicinity. It is an odd looking machine, and is not the appearance of an artillery weapon, but of a projecting boiler, which is mounted on wheels."

"It has long been known that steam carriages can be navigated on the water, and at the same time on land, and at the same time on the water. The prevailing belief is that they are useless and impracticable."

"But a more recent discovery has shown that a more useful and practical mode should not be lost sight of, and that it is not for some time to come."

"When the first covered steam carriage was used, it was not for some time to come, and it was not for some time to come."

works on Natural
Institution are
manufacturers,
shopmen, and
and stocking-
layers, masons,
and workers in
tailors, printers,
servants, and la-
polymasters, and ex-
of age, 52; females,
171; life honorary
figures show an increase
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ations which it has been
port. 63 members have
persons have joined the
more than last year,
increase of 25. The state-
that there is an amount of
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are as such as are not likely
for some years. The alterations
painting and repairs of the build-
outlay of \$71 10s., of which the
already been paid.

UNITED STATES LAW AMENDMENT ACT.

FOR PATENTS AND PROTECTION ALLOWED.

From Gazette, Aug. 6, 1858.

Dated 1st May, 1858.

moni, Crooked-lane—Imp. in apparatus for catching
in tidal rivers and other water courses.

Dated 29th June, 1858.

Stevens, 5 and 6, Cambridge-road, Cambridge-heath—An improved cooking utensil.

Dated 8th July, 1858.

77. J. F. Stanford, Howard-street.—A new and improved method of and apparatus for applying heated air in drying corn, hay, and other like articles, in the stack or otherwise, and in drying goods, and in heating and drying rooms and buildings.

Dated 2nd July, 1858.

1646. G. Parsons, 50, High-street, Lambeth—Imp. in apparatus for the prevention of injury to and the sudden bursting of steam boilers.

1648. F. Sang, 42, Charing-cross, and T. W. Rammell, 16, Spring-gardens—Imp. in the means of conveying letters and parcels from one place to another.

1550. F. H. Edwards, Gateshead-on-Tyne Iron Works—Imp. in pneumatic springs for railway carriages and other purposes.

1552. W. E. Newton, 66, Chancery-lane—Imp. in the construction of umbrellas and parasols.

Dated 10th July, 1858.

1554. G. H. Wain, Liverpool—Imp. in reefing and furling sails.
1556. J. F. Watson, 3, Lonsdale-villas, Bayswater, and V. B. Fa-

denilhe, Newington crescent—Imp. in the preparation of cocoa and chocolate, and also of nutritive compounds from the seeds of the plant called Soja Hispida and Cloer Arietinum.

Dated 12th July, 1858.

1560, J. Macintosh, Aberdeen—**Imp. in apparatus for the manufacture of articles of confectionery.**

1564. D. S. Wilton, 39, Tibberton-square, Lower-road, Islington—
Imp. in pianofortes.

1566. J. Taylor, Roupell-park, Streatham-hill—Imp. in the manufacture of blocks for the construction of sewers, drains, and arches.

Dated 13th July, 1858.

1568. E. Chard, Islington—Imp. in pianofortes.
1570. J. A. Fussell, Birmingham—A new or improved method of

ornamenting chandeliers, pendants, and brackets, for gas and other lamps, which method of ornamenting is also applicable to curtain bands.

1872. J. Edwards, 77, Aldermanbury, London, and T. Newey, 70, Navigation-street, Birmingham—Imp. in the manufacture of blind furniture.

1874. G. Buchanan, 29, Bucklebury—Imp. in sugar cane mills.
1876. W. Bendon, Otterhead, Hoxton—Imp. in the manufacture of

Dated 14th July, 1858.

36, Great George-stre

J. Cowan, Liverpool—An improved screw nail.

3. Jones, City Water Works, Oxford—Imp. in measuring liquids.

1. *Journal of the American Medical Association*, 1997; 277: 1033-1036.

number of Examiners occasionally examine a number of students to be examined.

I would suggest that, in every town intended to hold an Examination, arrangements should be made with the Society of Arts, and the proposed Examiners submitted to them. In the event of more than one Institution in a town, a joint action may be proposed. In towns there should also be no deficiency of gentlemen both able and willing to act in the several departments, and if the arrangement is confirmed by the Society of Arts, it would give a Board a status in its locality which would be of advantage. In places where no such Institution exists, the Committee of Education might make comparative fitness to undergo the Examination, and members desirous of being examined, and arrangements might be made accordingly.

With a Local Board extending over a particular district, some advantage might be derived from occasional inspection, and such suggestions might direct the attention of students to the subjects in which they may have the best opportunity of improvement, which can be done far better by a Local Board, organised for a specific duty, than by the efforts of the officers of Institutes, who are not acquainted with the necessities of the case. It would be a direct communication with the Society of Arts, and a reference for advice always at hand, in the case of the difficulties so often felt by those who are desirous of improvement, but who are not able to do so.

In all such matters public opinion is the basis of success, and though, in the present respect, there is much to be done, the Society of Arts Examination is a national institution, entitled to the support which, if they were to fail to receive. I would suggest that of a Local Board of Examiners, announced by printed Bill, in the newspapers, which should state the subjects in which Candidates should be examined, and places of the preliminary conditions to be observed, which would enable the student to choose his opportunity. I shall not add to the publicity, for the fact will be known, and will be prepared to dispense with the gain from the course of study.

To the Committees of Education, in union with the Society of Arts, they at once take steps to secure, in the same town or within the same selection of Examiners, the same made and approved, the same as possible, and that such preparation be immediately followed, either on the principle of the examination of competent teachers for the examination. If such a course of study in principal towns throughout the country, impetus will be given to the study, and the good will be received, and the good will be received in the moral and social improvement immediately affected by the number who will be studying in the place of sensual gratification.

Many are the complaints that have not accomplished the object designed; that the opportunity of the opportunity have become merely circumscribed. The complaint may be made, but if there be anything to be done, Institutions to their own advantage of Science and Literature.

Agriculture may cause duplicates or copies of models, plans, specimens, drawings, and specifications deposited in the Patent Office, and upon which Patents of Invention have issued, to be made, from time to time, and placed in the model rooms, museums, or libraries of the said Boards of Arts and Manufactures respectively; and it shall be lawful for the said Boards respectively, with the consent and approbation of the Minister of Agriculture, to establish in connection with their respective museums, model rooms or libraries, schools of design for women, on the most approved plan, and furnished and supplied in the most complete and appropriate manner that the funds at their disposal may admit of, regard being had to the claims thereon of the other objects for which they are hereby established; and also to found schools or colleges for mechanics, and to employ competent persons to deliver lectures on subjects connected with the mechanical arts and sciences or with manufactures; and the said Boards shall keep records of their respective transactions, and shall from time to time publish, in such manner and form as to secure the widest circulation among the Mechanics' Institutes, and among mechanics, artisans and manufacturers generally, all such Reports, Essays, Lectures, and other literary compositions conveying useful information, as the said Boards respectively may be able to procure, and judge to be suitable for publication. The members of the Boards of Agriculture and of the Boards of Arts and Manufactures, the Presidents and Vice-Presidents of all lawfully organised County Agricultural Societies, and of all Horticultural Societies, and all subscribers of five shillings annually to the funds of any such Society, in their respective sections of the Province, are by the Act constituted an Agricultural Association for that section. The members of the Board of Agriculture and of the sub-committee of the Board of Arts and Manufactures, and the Presidents and Vice-Presidents of County Societies, and of all Horticultural Societies (or any two members whom a County or Horticultural Society may have appointed Directors instead of its President or Vice-President), are constituted the Directors of such Agricultural Association. These Associations are directed to hold an annual Fair or Exhibition, open to competitors from any part of the Province. Power is given to the municipality of any city, town, village, county or township, to grant money or land in aid of the Agricultural Association for that part of the Province to which the municipality belongs, or of any Agricultural or Horticultural Society whatever duly organised under this Act, or of any incorporated Mechanics' Institute, within the limits of the municipality.

The appendix, annexed to the last quarterly report of the Board for Lower Canada, contains the following paper on the Education of Mechanics, to which they desire to give publicity and wide circulation:—

"The development of the industrial resources of any country should be one of the highest aims of its statesmen and legislators. The duty of governments to foster and promote, if not directly to regulate, the education of the people, is now almost universally recognised among civilised nations. In Canada both these patriotic objects are exciting attention in a greater degree than ever heretofore. It is desirable at present to call public attention to the best means of bringing educational efforts to bear directly upon the development of those resources of the country which fit it to become the seat of important manufactures.

"Abundant water power—inexhaustible mines of iron and other metals and economic materials, almost limitless forests of valuable timber, fertile grain fields from which to feed operatives more cheaply than they can be fed elsewhere; districts densely settled with a population admirably adapted by its docility and ingenuity to work at a lower rate of wages than the usual

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upon this continent,—all constitute advantages for the establishment and growth of manufactures which have induced men to plant them here, and must conduce to their successful prosecution. But in a contest waged against the large manufacturing establishments of other countries, long established and supplied with abundant capital, these advantages are not alone sufficient to secure success. It behoves Canadians not only to take steps to secure a more abundant supply of capital, and as soon as possible a larger market, but to make every necessary exertion to enable the classes desirous of embarking in manufacturing pursuits to become acquainted with the best processes now in use, and with all the improvements of process and machinery hereafter made, and to furnish them with opportunities of obtaining an education specially fitting them for manufacturing pursuits.

"It was, doubtless, with such an end in view that the Provincial Parliament at its last Session passed an Act for the establishment of Boards of Arts and Manufactures for both sections of the province. Those Boards have been formed in conformity with the provisions of the statute, but as yet have been necessarily little more than skeletons, unable, for lack of means, to enter upon operations likely to give them extended usefulness.

"Heretofore, Parliament has divided its grants for educational purposes into two classes, viz.:—that for rudimentary education in common schools, and that for superior education in grammar schools, colleges, and the universities. Few of those destined to become mechanics or factory hands have enjoyed the benefit of any but the common school education; very many not even of that. As a sort of supplementary educational grant intended for those classes, sums have been annually voted for Mechanics' Institutes. But in very many—if not in the vast majority of those institutions, no attempt has been made to furnish any education specially adapted for the improvement of mechanics in the prosecution of their calling. In a few, evening classes have been established, at which lads have been able to make up for the loss of common school education; reading rooms have been fitted up and stored with political, religious, and literary newspapers, libraries of miscellaneous literature gathered together, and lectures *de omnibus rebus*, delivered; but in only a very few instances have studies been pursued, or educational efforts persistently directed into a course likely to be directly useful to the mechanics' or manufacturers' career. There can be no doubt that even the rudiments of education are useful *per se* to the mechanic as well as to all other men; that hearing lectures and reading books on history or *belles-lettres* will serve to render him a more intelligent man; will stimulate a spirit of inquiry and a love of reading which may perchance be attended with the happiest results. But it is not less certain that the usefulness of the sums granted to those institutions would be very much increased, if steps were taken to furnish mechanics with the means of such an education in science as would specially fit them for their calling, in the same manner as the members of the learned professions of the law, physic, and divinity, are trained at the Universities, and school teachers at the Normal Schools.

"Hitherto science and the mechanic have been kept apart. The University man studies mechanics and the other sciences so necessary for the working man's success in life, but the bounty of Parliament has not enabled the poor apprentice to receive the benefits of such instruction. It is time to remove this anomaly from the educational system of Canada. In England, where education is left so much to voluntary effort, the Society of Arts, with its numerous affiliated institutions,—Mechanics' Institutes and Working Men's Colleges,—is using strenuous and successful exertions to afford instruction in the sciences to the working classes. In Paris, for these many years, the Institution of *Arts et Metiers* has furnished such instruction free to the working classes of the French metropolis. It were a shame to us in this new country

if we did not use like efforts, and, to the extent of our means, like instruments for the attainment of similar ends.

"In Norway, too, and Sweden, provision has been made for the education of the artisan. Brace, in his "Norwegian Folk," tells us that attached to the Latin Schools, which prepare students for the University, are, in eleven Norwegian towns, what are called real schools, from which the pupils are sent out to practical life or to the technical and military schools. In these, beside the usual instruction of the best schools, book-keeping, commercial correspondence, the properties of goods, &c., are sometimes among the branches. There are eight "Drawing Schools" in Norway. "To these, of an evening, the mechanics and labourers come together and receive instruction in modelling, drawing, mathematics and natural philosophy." The artisans of several trades are required to take out licenses, which are made dependent on the certificates of these schools. "The effect of the instruction is found to be excellent on the taste of this class in their various trades." Brace speaks of these as conferring a superiority on the Norwegian system of education over the American, to which, in other respects, it is so very much inferior. Of such schools in Sweden, coupled with a like eulogy, he says:—"In a small Swedish town, not larger than Bridgeport, for instance, you find an evening school, where mechanics can learn drawing, modelling, or the practical application of the natural sciences, without any expense. I visited one in Stockholm, which was truly a 'School of Art.' There were in it beautiful plaster models of Greek sculpture, and bas-reliefs of Italian statuary, and of the best Danish bas-relief, the which modern art has nothing more pure and classical besides plaster casts of heads, fragments of limbs, mathematical blocks, and architectural ornaments from which to draw and model. An original device struck me here of natural forest leaves arranged to draw or mould from. All this with lessons and teachers in the arts, lectures on chemistry and the sciences, is open every evening to labouring men and women. The consequence is, as in France, you have a class in Sweden which America has not, of artisans of taste, artistic mechanics, men and women, who show ingenuity and a tasteful originality in the manufacture of furniture, the decoration, painting, and preserving of rooms, the making of common ware and implements. Whatever you are obliged to buy in a house in the shops, without ordering, has not that awkward, angular look, which such articles have with us. Then these schools provide women with a new and beautiful means of livelihood, the arts of designing, painting, drawing, and the applying of science to manufactures. Such schools for labourers exist all through Sweden."

"The population of Norway is about 1½ million, and that of Sweden about 3½ millions. In all the elements of wealth they enjoy no superiority over Canada. The system of popular education is, as a whole, far behind ours. There is no reason why we should be behind them in this regard.

"It were a disgrace if, after taking the initiative in a scheme of improvement such as this, by the establishment of the Board of Arts and Manufactures, the Government and Parliament of the Province were to turn back from pursuing so good a work, and allow the institutions to linger in a state of inefficiency, or to perish for lack of sufficient pecuniary aid to make them really useful.

"It is hardly possible that any one can fail to see the great need of a scientific education more or less extensive to all who seek to prosecute manufactures successfully. Really useful education for the several branches of manufactures must include instruction with respect to the laws of nature, and those properties of bodies which are the subject of scientific generalizations. The manufacturing system of a country should be made gradually to extend to, and to render available for use, all the assemblage of substances in nature which constitute

natural resources, till all are made to add to its developed wealth. Its metals, clays, alates, marbles, granite, flint, and its other useful and precious stones; the bones, skins, tendons, horns, hoofs, and intestines of its animals; the wood, bark, roots, foliage, flowers, fruits, gums, sap, resins, and aromas of its trees and plants, all furnish matters of scientific research and industrial and skilled manipulation. The manufactories and workshops where the labouring classes are employed, are oft-times vast scientific laboratories, where industrial art is applying on a large scale to the production of the conveniences of life and of wealth, the processes discovered or improved by scientific research. Here, too, in the prosecution of his labours, the intelligent handicraftsman is day by day discovering new truths to be added to the domain of science. Heretofore philosophers have been indebted, in a rather larger degree, to the ahrewd and patient observers of the workshop for the hints on which they have proceeded to the discovery of scientific truths, than manufacturers to the pains-taking researches of the experimental philosopher for improvements in processes of manufacture. It is time that the savans should repay this debt—and they are endeavouring to do so. It remained for statesmanship to furnish them the proper means and instruments, through which to confer this benefit upon the manufacturing classes and the country. The Boards of Arts and Manufactures, if furnished with means of making their organisation useful in the manner contemplated by their founders, will furnish common ground where the learned man and the practical man or worker can carry on most usefully this interchange of ideas, deriving thence mutual profit—a profit sure to benefit the country. While, on the one hand, the working man would be taught in the schools or colleges founded for him under the auspices of the Boards, the great truths of Mathematical, Physical, and Applied Science, and, it is to be hoped, the important truths of Political Economy bearing on the condition of the labouring man as well,* the man of science would have brought under his notice from day to day, in the Museum and model rooms of the Boards, the various efforts of the inventive faculties of practical men to bring into use improved mechanical appliances, and better processes of manipulation, and would be enabled to note the real progress made, and the blunders committed. While the prime object of the bounty of Parliament should be to promote the education of the industrial classes, this secondary and indirect benefit conferred upon science should neither be disregarded nor looked upon as of trifling importance.

"Doubtless, for a time at least, considerable numbers of the operative class will be unable or unwilling to avail themselves of the opportunities offered them to obtain a scientific education, or at most will only acquire an acquaintance with the merest rudimentary elements. Yet even to these, evening schools will be opened to teach them what they can and care to learn. To the more intelligent among them, and the class immediately above them, an education could and should be afforded which should be in a genuine sense scientific, and at the same time decidedly practical. That there should be a well-educated, well-informed class of men to act as foremen and superintendents of all large establishments, is almost a *sine qua non* of manufacturing success. Having to contend with the larger capital and more firmly established factories of other countries, we cannot hope to compete

What could be more important in promoting contentment and tranquility among the masses than presenting to them the golden truths comprised in a comprehensive view of the philosophy of industry, teaching them the dignity of labour; the enjoyment springing from purity of life, from well-arranged domestic economy and sanitary regulations; explaining all that relates to the enjoyment of capital, and the fair remuneration of labour; together with just views of the aims and uses of public education,—laying before them in familiar terms those practically valuable parts of political economy bearing on their local and class interests,

with them satisfactorily, if, because of our tardiness in this respect, their workmen are also much better educated, better fitted, better trained for their work. The knowledge of the best processes of manufacture, the best machinery, and the best mode of its application tends to an immense reduction of expense. Ignorance breeds waste of time, labour, and capital, which must prove fatal to success. Take but one department of skilled labour, the care of steam engines, and how frightfully long is the catalogue of known losses of life and of property resulting from the unhappy ignorance of those who have had engines confided to their charge.

"The education of the labouring man for the proper exercise of his craft is second in importance to no question of political economy or practical philanthropy which engages the attention of statesmen. And it is much to be desired that Parliament will see fit to substitute for or add to the numerous grants usually made in aid of Mechanics' Institutes, (some of which are frittered away to serve the purposes of others than the class intended to be benefitted, and others used in a manner not calculated especially to promote the education of the artisan for his business,) a large grant to the Boards of Arts and Manufactures to enable them to promote such education. Properly furnished with means and appliances for their work, they can and are prepared to perform the labour which is necessary to secure the great objects contemplated in their formation. Without those means and appliances they are powerless for good."

ATLANTIC TELEGRAPH.

The instruments on both sides of the water are now at work, and messages pass at the rate of about a word and a-half per minute.

TRADE MARKS.

A meeting of the Birmingham Chamber of Commerce was held a short time since, Mr. GEORGE DOWNING in the chair. The question as to the improper use of trade marks, which has been recently brought before the public in connexion with the Collins Company, U.S., against certain manufacturers in Birmingham, Sheffield, and Wolverhampton, was discussed at some length.

Mr. J. D. GOODMAN (Joshua Scholesfield and Sons), in introducing the subject, said he was not sanguine that much good could be done by the chamber; but they should not be doing their duty by the commercial public if they flinched from considering it at a time when it had been brought so prominently before them. He was most anxious that no reference should be made to the individual cases that had recently been made public; they were not there as a court to sit in judgment, or to express opinions, or hear explanations, with respect to those cases; it was only the general ground upon which they could venture to touch upon that occasion. He thought, however, that they ought unmistakably to express their opinion that such a practice as the improper use of trade marks was wrong, and would be discouraged in every possible way by that chamber. With this view he had prepared the following proposition for their approval:—"That this chamber is anxious, in every way in its power, to discourage the improper use of trade marks, and refers the subject to the council, with a request that it may receive immediate consideration, with a view to such steps being taken as may be deemed advisable." As he had said, he did not anticipate practical good would result, as the chamber had little power of throwing a shield over any

might make to check the practice. Still the discussion of the question, and the publicity which might be given to it, might tend to effect their object in a great degree. The first question that arose was, "What was an improper mark?" There was no difficulty in seeing that it consisted in the use of the name of any other manufacturer residing in England or abroad; and further, all colourable imitations of such marks ought to be emphatically discountenanced. Then there was a class of marks, with regard to which there existed a misunderstanding. He referred to the names of manufacturers or firms no longer carrying on business. He believed it was a common practice to use the names of such parties, but it was quite true that in some instances the persons using them might have a property in them. Then, again, there was a great number of marks amongst which there was one kind that the chairman had spoken of. He referred to the common practice of stamping on goods the marks of the tradesmen who sold them, and not the manufacturer by whom they were made. This was a practice that ought to be deprecated in the strongest manner; but he did not see that it could be checked by any legislative enactment, nor did he think it was desirable such an attempt should be made to stop it, but were it put an end to it would redound greatly to the credit of the town, and he, for one, should be exceedingly glad to see everything that emanated from our local manufactories stamped with the word "Birmingham." At present he feared the best manufacturers in London, Sheffield, New York, and other places, were enjoying the advantage of placing their marks upon first-class goods made in this town, whilst the credit of the rubbish was left to us, though there was a good deal of credit attaching to even that. There were modifications in the use of a maker's name that were absolutely necessary. Many manufacturers stamp their name upon their best goods, their initials on the second quality, and their place of business on others. These were unobjectionable; but when they came to the use of fictitious names, which were commonly used in this town, although he deprecated the practice as not being strictly proper, it had, nevertheless, its uses. But returning to the improper use of trade marks, about which there could be no question, how could it be checked? This gave rise to another question, "Who is responsible?" As a merchant, he did not wish to flinch from a degree of responsibility in giving an order. But whilst he would hold the merchant responsible for his share he could not absolve the manufacturer from bearing his share. He was disposed almost to think that the greater share of responsibility devolved upon the manufacturers, and he would give them his reason. The merchant dealt in a vast number of articles, and he could not be supposed to have such an individual knowledge of each article as the manufacturer who made them, and therefore the latter might be presumed to be the best acquainted with the names on articles in his branch of trade, and when a manufacturer received an order to be stamped with a name which he considered doubtful, he ought to consult the merchant as to whether he had authority for using such names. The merchant when thus placed on his guard would act according to his discretion, and the responsibility would rest with him. Now, a short time ago, he heard of a merchant receiving an order for steel pens, to be marked with the name of a certain French pen manufacturer. He (Mr. Goodman) did not know the name of a single French pen manufacturer; but he thought the English manufacturer would naturally have a knowledge of such matters, and be able to inform the merchant with respect to them. On this ground it was he thought a greater share of responsibility ought to rest upon the manufacturer. If, however, both the merchant and manufacturer would do all in their power to put down the abuse of the trade marks, they should succeed at home, and by-and-by they should check the practice in other countries. No doubt at present English manu-

facturers were injured by the present system, and he was satisfied they had only to establish a principle in order to check it. Having observed that the Collins Company had sought and obtained legal redress in this country, and having expressed a fear that such would not be the case with an English manufacturer who might appeal to the American courts of law, Mr. Goodman remarked that he was not prepared to suggest any course that it was advisable to pursue in this matter, but he threw out the remark he had done in the hope that the chamber would be induced to assist both merchants and manufacturers in checking so injurious a system. There were many cases, in all probability, where manufacturers were using names with regard to which the chamber might entertain some doubt, and in such instances the chamber might call on them to explain the grounds on which they thought it right to use those marks, and if the chamber expressed its opinion that the marks were improper, the use of them would doubtless be discontinued.

Mr. C. REEVES seconded the proposition. He said he acquiesced in all that had been said relative to the use of illegitimate marks, and too strong language could not be used in condemnation of the practice when knowingly carried on. He did not think the checking of such practices was surmounted by such difficulty as Mr. Goodman appeared to imagine, and he considered that a legislative enactment, which should lay the responsibility on each individual concerned, would operate beneficially. He disagreed with Mr. Goodman's opinion, however, as to the amount of responsibility to be placed upon the manufacturer as compared with the merchant. How could a manufacturer, who never, perhaps, received a foreign letter, be so likely to be aware of the names of persons in business abroad as the merchant who was continually in the receipt of foreign correspondence? One great difficulty that seemed to him to be involved in the checking of the improper use of trade marks, was the objection entertained by the merchant to allow the name of the manufacturer to appear on goods exported to foreign countries. However excellent in material and workmanship goods might be, and whatever reputation a manufacturer might have, the last thing a merchant would do would be to allow him to place his name upon them if they were for exportation. He contended that the manufacturer ought to have the power of taking out a trade mark, leaving it to the merchant to accept the goods or not, as he might choose, and this would do away with the objection to the use of the manufacturer's name, whilst it would afford the manufacturers that protection to which they were entitled. He hoped ere long to see something of this kind carried into effect by law, as at present there was scarcely safety to any manufacturer using marks in cases where buyers required their names stamped on them.

Mr. J. S. WRIGHT took a similar view of the case. Mr. Reeves, and considered the merchant ought to be made responsible in a greater degree for the use of foreign trade marks than the manufacturer, who, in many cases, might be a person that could not write his own name. He regretted that this question should have been brought under their notice in the manner it had by a recent event; but he believed much good would result from the discussion of it. With regard to this town, he thought it had suffered probably more than any other in not affixing "Birmingham" to all the goods manufactured here. There was another branch of the question in which, he thought, they ought to take action, and that was with reference to foreign made goods coming into this country bearing English names.

Mr. REEVES said that an enactment introduced some years ago into parliament by Mr. Hawke, M.P. for Dudley, and which was still in force, would meet the class of cases referred to by Mr. Wright.

Mr. GODDARD said Mr. Goodman was in error in supposing that an English manufacturer would not obtain

address in the American law courts for an infringement of his name.

After a few words from Mr. MAXTON in support of the proposition, in the course of which he said he knew many names were wrongfully made use of,

Mr. GOODMAN said he never intended to convey the impression that he thought the merchants ought not to bear their fair share of responsibility.

The CHAIRMAN, before putting the resolution to the meeting, suggested, as worthy of consideration, whether the marks analogous to the brands used in the iron trade, might not be used with advantage.

The motion was then put and carried unanimously, and the meeting was dissolved.

TUNNEL THROUGH THE ALPS.

A communication on this subject has recently been made to the French Academy of Sciences by M. Menabrea, and published in the *Comptes Rendus*, states that several months ago the immense work of boring a tunnel under the Alps, between Modane and Bardonnèche, was commenced. These places are situated on opposite sides of the Alpine chain which divides Piedmont from France, at a point where the valleys of the Arc and the Aisne are almost parallel to each other, and here they are on the same level, the mountain being most narrow at this spot. This important position had been noticed about twenty years ago by M. Medoil, and had often attracted the attention of engineers and geologists. The tunnel will be 12½ kilometres in length, and is designed the same vertical plane, but, to facilitate drainage, is somewhat higher in the middle than at the extremities, as to form a slope on each side, one being an inclination of five in a thousand, and the other being twenty-two in a thousand, in consequence of a difference of level between the two extremities, the heights being—Bardonnèche (southern orifice), 1,324 metres; highest point, 1,335 metres; Modane (northern orifice), 1,190 metres above the level of the sea. The crest of the mountain being 1,600 metres higher than the highest point of the tunnel, the sinking of shafts was practically possible; hence the tunnel could only be worked at its extremities, so that it was calculated that the labour by ordinary processes could not be completed in less than ten years. The difficulty of ventilation was also very great. The mountain having been examined geologically by MM. Elie de Beaumont and Angelo Sismondesi, was found to contain micaceous sandstone, micaceous gneiss, quartzite, gypsum, and limestone; of these various kinds of rock, the quartzite alone would be likely to offer any serious resistance to engineering operations, but the stratum of this appeared not likely to be very thick. The plan proposed for overcoming the difficulties was put forward by three Sardinian engineers, MM. Sommeiller, Grattoni, and Lodi, who proposed to turn the abundance of water, which the locality was remarkable for, to account by applying it to a peculiar system of ventilation. The first apparatus described is a syphon which consists in an hydraulic syphon turned with it communicating by one of the shafts with the water, and by the other with the reservoir. The water, descending into the first branch, and by the pressure it exercises on the water in the second, which is then forced into the reservoir. The compression of the air arrives at a certain point, and is then released, by which the water contained in the syphon is forced out, and the operation re-commences. The emission of the air is regulated by a small machine acting by means of a column of water; and the air in the reservoir is maintained at a constant degree of pressure by a column of water communicating with the reservoir above. This condensed steam is used

both as a motive power, and for ventilation. Commissioners were appointed by the Sardinian Government, of which the author of this paper was one, to investigate the efficacy of this plan. Their experiments were made with two kinds of perforators, worked by condensed air instead of steam, one invented by Mr. Bartlett, the other by M. Sommeiller; it is stated that by means of these, holes for blasting may be bored through the hardest sienite in one-twelfth of the time which would be required if ordinary means were employed. The perforators have also another advantage; in a space where three couples of miners could hardly be placed, 18 perforators may be set to work; so that, by these contrivances, it is said that the perforation of the tunnel may be effected in six years instead of 36, as the inventors calculate upon advancing three metres per day on each side of the mountain, or six metres per day in all. It is calculated that it will require 85,924 cubic metres of air per 24 hours to replace that which has been vitiated by respiration, torches, and gunpowder at each end of the tunnel, which is equivalent to 14,320 cubic metres of air condensed to six atmospheres. As the quantity of air necessary to put in action the perforating machines will be only 667 cubic metres at the pressure of six atmospheres, a large portion of the compressed air will thus be available for ventilation. Both on the side of Bardonnèche, and on that of Modane, it is said that water power exists which is abundantly sufficient for the required purpose. Whenever this great work is finished, it is calculated that the journey from Paris to Turin will only occupy 22 hours, and from Paris to Milan only 27 hours. The author is of opinion that great credit is due to the Sardinian Government for the liberal and judicious manner in which it has encouraged this great and important work.

PAPER DUTY.

The Commissioners of Inland Revenue in their last report in reference to this subject state as follows:—

“The quantity charged with duty in the year ended 31st March 1857, 192,297,399 lbs.; in the year ended 31st March 1858, 187,414,667 lbs.

If the objections so constantly urged against the paper duty were such as we are accustomed to hear most insisted upon in the case of Excise duties generally, namely, their restricted and oppressive incidence on the manufacturer, the advocates of the abolition of the tax would find it difficult to make out their case. There is scarcely any duty in the collection of which our interference is so little felt, and in which we are so continually adapting our regulations to the wants or wishes of the trade.

An instance which has occurred this year is a fair sample of the difficulties which we have to meet, and of the disposition with which we encounter them; we allude to the drawback granted to envelope makers on their waste cuttings.

The introduction of the penny postage has become a very considerable branch of the papermaking trade. At first it was carried on by stationary papermakers being precluded by the exigencies of the trade from engaging in it. But so long ago as in 1840 were induced by the representations of the trade to remove the restriction, unnecessary to the security of the revenue, and to a very serious degree with respect to the economical course of manufacture. This change in our regulations was the removal of a prohibition which had been put in the way of his business to the means of avoiding

the payment of duty upon a considerable quantity of paper which never went into consumption, and which, therefore, according to ordinary rule, would if practicable, be fairly entitled to exemption or drawback. This was the waste produced in cutting the envelopes from the rectangular sheets of paper.

So long as the papermaker was prohibited from cutting envelopes, the duty, being charged upon the paper before it left his mill, attached to that portion which afterwards was cut away by the stationer in small angular strips—useless for any of the ordinary applications of paper; but the envelopes now allowed to be made at the paper mill are charged after being cut from the sheet, and the waste is again made into pulp and reproduced as paper.

The concession was thus of very great importance to the papermaker, and gave him the advantage over the stationer in the manufacture of envelopes, which must have been extremely valuable. It is indeed surprising that the stationers, some of whom carry on this business to an enormous extent, should not have succeeded before last year in impressing us with a sense of the injury inflicted upon them by the regulation which we had made in favour of their competitors in trade; but their case, when fully developed, was so strong, that we could not avoid making some attempt to give them relief, notwithstanding numerous practical difficulties which we foresaw. These however have been overcome, and under your Lordship's authority we are now enabled to give to stationers a drawback of the duty on the waste cuttings produced in making envelopes, on condition that such cuttings shall be reduced to pulp under the superintendence of an officer at a paper mill.

To place these two descriptions of traders on an equal footing may indeed seem too simple a matter to deserve the notice which we have taken of it. But your Lordships are aware that this concession involved great practical difficulties and some danger to the Revenue,—more, indeed, than we should have been justified in incurring for the sake of any less urgent claims or less important and increasing trade.

Few persons have an adequate conception of the magnitude of that trade, and few are aware that the superiority of the British over the German, French, and American manufacture has obtained for our exporters a steadily increasing business in the markets of the United States and Canada, of India, Australia, and all the British Colonies. We are entitled to regard this as some evidence that our fiscal regulations do not press unduly upon the manufacture of paper.

CONSUMPTION OF SMOKE.

Some short time since, the owners of steam-tugs plying upon the Tyne, to the number of 150, received notice from the Inspector of Nuisances of Newcastle-on-Tyne, under pain of being proceeded against for penalties under a local Act, to consume the smoke emitted by their boats, which at all times, but more especially on the occasion of busy sea tides, when from 100 to 200 vessels have to be towed out at a tide, issued from the funnels of the steam-tugs in thick volumes of the blackest density. The tug owners thereupon consulted Mr. Armstrong, of Elswick, the engineer, and, under his advice, enlisted the services of Dr. Richardson and Mr. Reed, of Newcastle, under whose superintendence experiments have for some time past been carried on, at Elswick, near Newcastle, to prove the practicability of consuming the smoke produced by the coal raised from the great coal-fields of Northumberland and Durham. It was arranged that one of the steam-tugs should be placed at the disposal of Dr. Richardson and Mr. Reed, for the purpose of making such alterations in the furnaces as they considered would effect the desired object, and in order that, in case of success, the other steam-tugs might be altered in a like

manner. The *Expert* steam-tug, belonging to Mr. William Melbourn, of North Shields, was offered for the purpose, and a series of experiments were made upon the furnaces, the plan adopted being very simple, consisting of a proper admission of air into the furnace, which, combined with careful stoking, was expected to consume the smoke. After certain alterations were effected, the tug was taken to sea, with a party of steam-tug owners and their solicitor, Mr. Kewney, and the Inspector of Nuisances on board, and it was found that the improvement effected was very great, upwards of 75 per cent. of the smoke being consumed, and the remainder being of a character far less offensive, being thin and light-coloured. The inspector considered that the result was very satisfactory. Dr. Richardson and Mr. Reed were determined however, to effect a perfect consumption of smoke, and made further alterations. On Thursday, the 5th instant, the *Expert* proceeded to sea, on a voyage from Newcastle to Warkworth, a distance of 30 miles, having on board Mr. Miller and Mr. Taplin, Government engineers, sent from Woolwich and Portsmouth, to test the experiment going on at Elswick to consume the smoke, with a view to re-introduce the Northern coal into the naval yards, and also having on board Dr. Richardson and Mr. Reed, and a party of steam-boat owners and their solicitor. It was found that the alterations, which were of a simple character and comparatively inexpensive, entirely effected the consumption of the smoke, there being none whatever visible throughout the voyage out or home, except when Mr. Reed, in order to exemplify the truth of the system, stopped the admission of the air, and allowed the smoke to be produced, showing at pleasure either smoke or not as he thought fit. The other steam-tugs in the association, and the steam-ferries on the Tyne, will be furnished with the apparatus forthwith, and it is anticipated that a great nuisance to the river and harbour towns of the Tyne, occasioned every sea-tide by a black fall of smoke hanging over them, and sometimes entirely obscuring the view of the sea, will be entirely removed.

PATENT LAW AMENDMENT ACT, 1852.

The following is the report of the Commissioners of Patents for the year 1857, in continuance of their report of proceedings for 1856.

"The number of applications for provisional protection recorded within the year 1857, was 3,200: the number of patents passed thereon was 2,028; the number of specifications filed in pursuance thereof was 1,771; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,172.

The number of applications recorded within the six months of the current year (1858) was 1,474: therefore, estimating the total number for the year at about 3,000, a decrease of about 200 on the whole year, as compared to the number of the year 1857, may be expected.

The Act 16 Vict. c. 5, enacts that all letters patent for inventions to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be payment before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year.

One thousand nine hundred and thirty-one patents bear date between the 1st July 1854, and the 30th June 1855; the additional stamp duty of £50 has been paid

202 of that number; and 1,429 have become void by reason of nonpayment.

All the provisional, complete, and final specifications, filed in the office upon the patents granted under the Act, have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, and within three weeks of the respective dates of filing, according to the provisions of the Act 16 and 17 Vict. c. 115.

The provisional specifications filed in the office lapsed and forfeited, have also been printed and published in continuation.

Printed certified copies of the specifications filed in the office, as also certified copies of patents, and of the Record Book of assignments of patents and licences, with copies of such assignments and licences, have been sent, in continuation, to the office of the Director of Chancery in Edinburgh, and the Enrolment Office of the Court of Chancery in Dublin, pursuant to the Act of 1852 and the Act of 16 & 17 Vict. c. 115.

The work of printing the specifications of patents enrolled in Chancery previous to the Patent Law Amendment Act (1852), 12,977 in number, the first dating October 1711, was commenced in September 1853. This work has been completed.

In a schedule to the report is given the following account of Stamp Duties, paid upon passing Patents for Inventions under the Act to substitute Stamp Duties for Fees (16 Vict. c. 5,) for the year 1857:—

3,200 petitions for grant of letters patent at £5 each	£16,000	0	0
2,294 notices of intention to proceed with application, at £5 each	11,470	0	0
55 notices of objection to the grant of letters patent, at £2 each	110	0	0
2,031 warrants for patents, at £5 each ...	10,155	0	0
3,028 patents sealed, at £5 each	10,140	0	0
1,976 specifications filed at £5 each	9,880	0	0
716 entries of assignments of patents and licences, at 5s. each	179	0	0
150 searches and inspections at 1s. each.	22	10	0
16,692 folios of office copies of documents, at 2d. per folio of ninety words	139	2	0
510 patents upon which the progressive stamp duty of £50 has been paid ...	25,500	0	0
1 patent on which the progressive stamp duty of £100 has been paid...	100	0	0
0 patents granted under 53rd section of the Act, on which the progressive stamp duty of £16 18s. 4d. has been paid	166	13	4
duplicate patents issued in lieu of original patents lost or destroyed, £5 each	25	0	0
	£83,887	5	4

To the report is annexed the balance-sheet of income and expenditure for the year 1857, as follows:—

RECEIPTS.			
a stamp duties in lieu of fees	£83,887	5	4
y sale of prints of specifications, indexes, &c.	1,463	16	11
urplus income on balance of accounts, from the 1st October, 1853, to the end of the year 1856	13,678	11	6
	£99,029	18	9

PAYMENTS.

Fees to the law officers of England	£ 8,918	9	0
Their clerks	798	10	0
Salaries of officers and clerks in the Commissioners' office	4,546	0	0
Compensations	4,584	0	0
Current and incidental expenses in the Commissioners' office	7,565	11	8
Cost of stationery supplied by Her Majesty's Stationery-office, books for the free Library established in the Patent-office, and binding	843	13	8
Rent of offices and library	490	0	0
Messrs. Eyre and Spottiswoode, for printing specifications of patents, indexes, &c., and	38,506	3	2
Lithographers' bills for drawings accompanying specifications			
Cost of paper supplied to printer and lithographer by Her Majesty's Stationery-office	9,161	0	6
Expenses incurred in respect of the Museum at South Kensington	1,966	0	3
Clerks' salaries for ditto	375	0	0
*Revenue stamp duty account as below	15,275	0	0
Surplus Income	6,005	5	6
	£99,029	18	9

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-eighth meeting of the British Association for the Advancement of Science will commence in Leeds on Wednesday, the 22nd of September, 1858, under the presidency of Richard Owen, Esq., M.D., D.C.L., V.P.R.S., &c.

The General Committee will meet on Wednesday, the 22nd of September, at one p.m., for the election of sectional officers, and the despatch of business usually brought before that body. On this occasion there will be presented the Report of the Council, embodying their proceedings during the past year. The general committee will meet afterwards by adjournment.

The First General Meeting will be held on Wednesday, the 22nd of September, at 8 p.m., when the President will deliver an Address; the Concluding Meeting on Wednesday, the 29th of September, at 3 p.m., when the Association will be adjourned to its next place of meeting.

At the Evening Meetings, which will take place at 8 p.m., discourses on certain branches of science will be

* The Act of 1852, in lieu of the old duties upon patents, imposed a revenue stamp duty of £5 upon the warrant of the law officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80 at the expiration of the seventh year of the patent.

The Act of 1853 (16 Vict. c. 5.) converted all the fees imposed by the Act of 1852 into stamp duties.

The Revenue stamp duty account for the year 1857 is as follows:—

2,031 warrants of the law officers for patents at £5 each	£10,155	0	0
510 patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates, (£10 being Revenue stamp duty, and £40 fee stamp duty;) 510 at £10 each	5,100	0	0
1 Patent on which the progressive duty of £100 has been paid, £20 Revenue stamp duty, and £80 fee stamp duty	20	0	0
	£15,275		

delivered, and opportunity will be afforded for general conversation among the members.

The Committees of Sections will meet daily, from Thursday, the 23rd, to Wednesday, the 29th of September, inclusive, at 10 a.m. precisely.

The Sections will meet daily, from Thursday, the 23rd, to Tuesday, the 28th of September, inclusive, at 11 a.m. precisely.

Notices of communications intended to be read to the Association, accompanied by a statement whether the Author will be present or not at the meeting, may be addressed to John Phillips, Esq., M.A., LL.D., F.R.S., Assistant General Secretary, Magdalen Bridge, Oxford; or to the Rev. T. Hincks, W. Sykes Ward, Esq., and Thomas Wilson, Esq., Local Secretaries, Leeds.

SOUTH KENSINGTON MUSEUM.

During the week ending 14th Aug., 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,590; on Monday and Tuesday (free evenings), 4,028. On the three Students' days (admission to the public 6d.), 588; one Students' evening, Wednesday, 88. Total, 7,289.

Home Correspondence.

THE SOCIETY OF ARTS EXAMINATIONS.

Sir,—In my last letter I alluded more particularly to the mode of making Local Examinations more directly serviceable to the object in view by establishing, if possible, systematic action upon a uniform principle. I would now, however, direct the attention, not only of the Council, but also of the local authorities, to the advantage and propriety of extending the system of Examination as far as possible to the pupils of elementary classes. There is no doubt that the principal design of Mechanics' Institutions was to extend the cultivation of science and literature to those portions of the community who, from the nature of their vocations, had no other opportunity of mental improvement, but it is equally true that, from the defects of early education, which may be owing, perhaps, to early employment and parental neglect and indifference, the instruction imparted in a great many Institutions is altogether of an elementary character, whilst in many Institutions where class instruction is extensively carried on, that of an elementary character greatly preponderates. We have, therefore, to deal with a state of things which exists, if not exactly as we would have it; and the prudent course would be to render it available to the greatest extent for the promotion of that self-culture which is the distinguishing characteristic of the people of this country.

In an examination of elementary acquirements, there is, of course not required that skill in the examiners which is indispensable for the subjects comprised in the programme of the Society of Arts. Indeed all that is requisite might be accomplished by local means, but material weight would be given to such examinations if conducted under the auspices of the Society, and certificates of a lower grade granted for proficiency. The hope of gaining a certificate would operate as a stimulus to improvement, whilst prizes, which need only be of small value, would, in many cases, be provided by those in the neighbourhood who take an interest in the welfare of the Institution, and who would have less objection to give pecuniary aid where its good effects are visible, than is too often the case at the present time, when so few comparatively seem desirous to take advantage of the opportunities afforded them. It might also be worth the consideration of Local Institutions if an incentive to elementary improvement might not be created by making

membership free of payment an additional reward to the holders of first-class certificates.

All who have paid any attention to the subject must admit that no system which has yet been devised for the promotion of the instruction of the population in useful knowledge has proved so successful as that of Examination. It is, indeed, in exact accordance with the feelings which most commonly animate human nature. Those who have mastered the drudgery of learning, and bottomed their position in society, can readily appreciate the benefits of mental cultivation, but the great majority of our youth, whose subsistence depends upon their industry, whose labours of the week supply the wants of the week, are not so well able to realise to themselves the future good which they may acquire. They need some aid to lend strength to their resolves and invigorate their exertions; and, besides this, they cannot avoid the feeling that, whatever may be the amount of knowledge they may accumulate, it will prove of little value to them beyond the mere possession of it, because the humility of their position in life forbids them the opportunity of making their acquirements known to those who could render them of any value.

It is for this latter reason more especially that public examinations prove so important an aid to voluntary exertions for self-improvement, particularly with reference to the members of Mechanics' Institutions; and as those who possess the least knowledge have the least desire for the acquisition of more, the application of the stimulus to elementary instruction becomes obviously the more necessary. It may also be viewed as a preparation of students for the Examinations of a higher class, and, by rendering our young men familiar with the practice of emulation, prove of threefold benefit.

To effect this object, it will not be necessary for the Society of Arts to do more than lend its countenance to devise a uniform plan of action which shall be applicable to all Mechanics' Institutions in Union with the Society, and to grant such certificates as may be awarded by the Local Boards of Examiners appointed under their sanction. Such an addition to the labours of the Local Examiners would help to give permanence to their existence as a Board, and promote, in a great measure, that co-operation with Institutions which is so highly desirable. I would suggest that elementary examinations should be held a short time previously to the preliminary examinations for the higher branches of study, and that some but those who have shown proficiency in the first should be allowed to take part in the second. This would help to lessen the time occupied in the ordinary preliminary examinations, because the attainments of the candidates in the elementary branches of education would have been previously ascertained.

In order, however, that any benefit should arise from such incentives to education, it is indispensable that the committees of Mechanics' Institutions should use active exertions to promote the improvement of their own members. It will be a fatal mistake to rely upon the Society of Arts, or even a Local Board of Examiners, or, indeed, on any other body than themselves, if they desire to see their Institutions flourish. It is wisdom to lend aid where aid may be of service, but it is folly to allow such aid to supersede our own exertions. The great value of an Institution is in the labour devoted to the instruction of its classes within its own walls, and the value of the Examinations is in the additional stimulus which they afford to the exertions of the members, and the opportunity which they give for testing the extent of the improvement. Knowledge is but the means to an end; the certificate gained by examination is but an evidence of its acquisition, but the more substantial reward will be sure to follow, as it has followed in so many striking instances, and these facts should be steadily kept in view, both by teachers and pupils, as well as by the committees of Institutions.—I am, &c.,

FARNETT BLAKE.

Leeds.

Proceedings of Institutions.

Asmford.—The last report of the South Eastern Railway Mechanics' Institute states that the number of members has increased from 104 to 134. A series of monthly entertainments have been given during the winter months, consisting of lectures, essays, and readings from celebrated authors, varied with performances by the glee class. These have been remarkably successful, having been so well attended that on two occasions the room could not accommodate the number of persons desiring admission. The lectures in connection with the Institute have also been attended by a greater number of members than during any preceding season. The funds of the Institution have been augmented by a donation of £5 from the Directors of the South Eastern Railway Company, in addition to the members' subscriptions and the proceeds of the entertainments. The glee class still continues to hold its meetings weekly for the practice of glees, and a drawing class has been successfully carried on. Several addresses have been made to the library.

Loughborough.—The tenth annual report of the Literary and Philosophical Society for the past year shows that it has fully maintained its position and character, both as to the interest and instructiveness of its lectures and papers and the number and attendance of its members. The committee state that it had sometimes, in years past, been a subject of regret that so few of the actual members of the society gave it the benefit of their labours in different branches of learning and science; and it was therefore with great satisfaction that they are able to state that out of thirteen gentlemen whose lectures and papers have been given during the past year, eight were members of their society. The society now consists of 162 members, 19 new members having joined, and 15 having ceased to belong to it. During the past year the following lectures and papers have been given:—Mr. J. E. Carpenter, of London, "The Road, the River, and the Rail;" Rev. T. White, M.A., "The Influence of Christianity on the Law of Nations;" Mr. Spanton, "Our Connection with the Society of Arts;" Rev. T. A. Smith, M.A., "The Study of Insects;" C. W. Wood, Esq., of Woodhouse, "The Houses we Live in," illustrated by experiments chiefly in relation to the human body; Rev. W. Larrom, of Kegworth, "China: its Geography, Religion, Literature, Manners, and Customs;" Prof. H. Christmas, M.A., of London, "The Domestic Habits of our Ancestors;" H. Vincent, Esq., of London, "The Progressive Tendencies of Society in Great Britain;" E. Vincent, Esq., "Our Young Men and Women; their Present Position and Future Prospects;" J. F. Hollings, Esq., of Leicester, "Russia under Catherine I.;" J. F. Hollings, Esq., Ditto, continued; Dr. Edlowes, "On Man, contrasted with the Lower Animals;" Rev. T. Drake, M.A., of Barrow, "The Mosaic Account of Creation as distinguished from Geology;" Rev. J. F. Bateman, M.A., of Sutton Bonington, "Notes of a Visit to Canada and the Atlantic Cities of the Union;" Rev. H. G. Tomkins, B.A., of Kegworth, "Life of Alfred the Great;" Mr. H. Hughes, "The Iron Manufactures of South Wales and Staffordshire."

Newport.—The seventeenth annual report of the Athenæum and Mechanics' Institute, states that although he advance has not been so marked as in the preceding year, the Committee still think that there is reason to congratulate the members upon the present state of the institution. The past year has been one of great commercial depression, from which the district has suffered to a very large extent. The number of members, however, has not diminished, but shows a slight increase. The Committee, having last year received notice from the Town Council to vacate the rooms so long held by them at the Town-hall, have made arrangements with the

Diocesan Board of Education to take their school premises in Dock-street, for the purposes of the Athenæum, with the option of purchasing the same at the end of a year for £150. This they regard as a favourable arrangement. The building, with a small outlay, will afford a reading-room quite large enough for the purposes required, with commodious library and committee-room; and should the Athenæum increase to that extent which may be reasonably expected, there is a piece of ground large enough to erect a building, with a hall larger than any in the town. At the general meeting, held on the 27th April, 1857, the committee were recommended to appoint a paid secretary. They appointed the present secretary, Mr. Matthew Johns, and are pleased to state that they are fully satisfied with the manner in which he has performed his duties, and have re-appointed him for the ensuing year. The Committee regret that during the past year there have been no classes in existence in connection with the Institution. This they regard as a great loss to the members, and hope that in future they may be able to secure the services of a sub-committee, whose special duty shall be to look after this department of the Society's usefulness. They specially invite the attention of the members to the Examinations instituted by the Society of Arts, and while they regret that as yet there has been no offer of members to undergo such examination, they trust, for the credit of the Institution and the honour of the town, that another year will find some members ready to present themselves as candidates for examination. The average number of members for the past year has been 472 per quarter, being an increase of 16 members per quarter over the average of the preceding year. The library now contains 2,535 volumes. The committee have expended from the funds of the Institution £21 10s. 6d. in the purchase of books, and also the sum of £5, kindly placed at their disposal for that purpose by Sir Charles Morgan, Bart. Numerous donations have also been received. The number of volumes circulated during the past year has been 10,437. The catalogue has been completed, and great praise is due to the librarians for the very creditable manner in which they performed their task. The printing cost the Institution £12. The following lectures and entertainments have been given during the year:—Miss Julia St. George, "Home and Foreign Lyrics;" Sir Thomas Phillips, F.G.S., "British Rule in India;" Mr. J. T. Topham, "An Evening with Shakespeare;" Mr. J. W. R. Dickens, "Social Life in England;" Mr. F. R. Young, "Single Life;" Mr. J. E. Carpenter and the Misses Mascall, "The Road, the River, and the Rail. An Hour in Fairy Land;" Mr. J. K. Applebee, "Life's Poetry," and "Oliver Goldsmith;" Mr. Walter Rowton, "An Evening with our Comic Authors," and "Illustrations of Ancient Minstrelsy;" Rev. W. S. M. Aitchison, "Tennyson and his Poetry;" Mr. Ellis Roberts, Miss Annie Cox, and Miss B. M. Waugh, "Notes of a Wandering Minstrel;" Henry Owgan, Esq., LL.D., "The Four Literary Eras;" Mr. Augustus Fairbairn and the Misses Bennett, "A Night with Burns;" Mr. C. F. Partington, "India" (two lectures); Miss Clara Seyton, "The Omnibus." The Committee have paid in fees to lecturers, and expenses connected therewith, the sum of £103 2s., the receipts having only amounted to £77 19s., thus causing a serious loss to the funds of the Institution. The average attendance was 145, which, compared with that of last year, shows a deficiency of 43 per lecture. The committee, in closing their report, desire especially to express their recognition of the services rendered to the institution by the honorary secretary, Mr. John Wood, whose persevering efforts on its behalf entitle him to the gratitude of the members. A testimonial, consisting of a valuable microscope, subscribed for by members of the Institution, was presented to him at the last annual meeting.

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W. F. F.

TRADE MARKS - PATENTED AND REGISTERED.

W. J. Johnson	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318
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Journal of the Society of Arts.

FRIDAY, AUGUST 27, 1858.

NEW ZEALAND.

The Society has just received from the Colonial Secretary of New Zealand a Blue Book, containing the statistics of that Colony for the years 1853-1856 inclusive:—

From these it appears that in 1856 the colony contained a European population of 48,193 souls, including 653 military—viz., 27,418 males and 20,775 females; 653 military included 2,062 males and 591 females. The population in 1855 was only 37,192, divided among the province, excluding the military, as follows:—Auckland, 15,335; New Plymouth, 2,488; Wellington, 252; Nelson, 7,509; Canterbury, 6,160; Otago, 36. The births were 1,722 (904 of males and 818 of females); 406 deaths occurred, and 404 marriages were solemnized. Of the marriages 169 were solemnized according to the rites of the Church of England, 15 according to those of the Presbyterian kirk of Scotland; according to the rites of the Roman Catholic Church, according to the rites of the "free church" of Scotland; 4 Presbyterian congregations, 48 Wesleyan Ministers, 12 of "Congregational Independents," 2 of Unitarians, 14 of the "Primitive Methodist Society," 4 of the Lutheran Church, and 14 by registrars. As far as has been ascertained, it appears that of the whole population 11,309 cannot read, 6,170 can read only, and 31 can both read and write; the percentage of each is respectively 24.83, 13.55, and 61.62. 326 vessels, of an aggregate tonnage of 85,748 tons, entered inwards at the several ports of New Zealand in 1856; and 323 tons, with an aggregate tonnage of 82,991 tons, cleared out. The above is exclusive of coasting vessels. The value of the imports into the several ports was £1,868, and that of the exports £318,433. The imports into Auckland alone were of the value of £270,987, included apparel and drapery, arms and ammunition—candles, flax, sheep, hardware, leather, glass, agricultural implements, metals, provisions, wine, and so. The principal exports from Auckland appear—Kauri gum (£14,000), bullion and coin (£20,000), copper ore (£10,628), oil (£5,922), potatoes (£10,018), timber (£5,308), and wool (£6,289). Total exports of grain, flour, &c., from the colony in 1856 were in value (£23,151), Kauri gum (£18,591), oil (£14), potatoes (£19,958), timber (£23,008), wool (£72) (2,559,618 lbs.). 101,596 letters were received in the colony in 1856, and 95,164 were despatched; 91 newspapers were received, and 124,153 sent out. Total quantity of land in culture was—in Auckland, 9½ acres; in New Plymouth, 9,608; in Wellington, 15,000; in Nelson, 13,869; in Canterbury, 1; and in Otago, 5,022. The total revenue of the colony in 1856 was £188,328. The total convictions of the colony in the magistrate's courts of the colony for 1856 was 2,006, of Maories 86, of which 1,151 were for Europeans (Europeans), 38 (Maories). The mortality in the colony is 4.8 per thousand, being less than in the United Kingdom, as stated in the return. 510 men were annually admitted into hospital out of a thousand, being as stated one-seventh than what occurs among infantry soldiers in the United Kingdom. Suicide appears to be more frequent in the infantry in the United Kingdom—5 out of 10,000 in the place of two. Fevers are most unknown, except a few bilious febrile attacks after intemperance and exposure to the heat.

Smallpox has not yet appeared in the islands. Measles were introduced in 1845, and swept off 4,000 of the aborigines, the old and the young being the severest sufferers. Several cases of scarlet fever simultaneously occurred. The troops enjoy comparative immunity from pulmonary diseases, and, although influenza swept over the colony in 1853, no soldier succumbed to the epidemic. Diseases of the liver are infrequent, compared with England, and, although diseases of the digestive organs are more frequent than there, the attacks are milder. The troops continue to be singularly free from a certain class of maladies generally prevalent among soldiery. No season can be reckoned less salubrious than another in New Zealand. A series of meteorological tables are given, compiled from observations made at places in or near the coast. None have yet been made, however, in the interior, the climate of which we are as yet completely ignorant of, and it is hoped that settlers resident away from the sea coast will make meteorological observations, so that intending emigrants and others may be able to judge of the inland seasons of the country from numerical data, in place of flattering verbal descriptions.

From the data thus obtained, and other sources of information, the coast climate of New Zealand, from Stewart's Island to the North Cape, may be described as the most changeable in the world, and at the same time the most strictly temperate. For, between these two points, including a space of eight hundred miles in latitude, calms, rain, and winds, clouds and sunshine, and heat, varying between forty and seventy degrees of Fahrenheit's scale, are occasionally experienced in twenty-four hours. This singularity of the climate is probably produced by the shape and mountainous character of a great part of the country and the immense sea encircling the islands. Much importance has been attached to the mean annual temperature of countries, and New Zealand, in consequence of conclusions from this source, has been said to possess an Italian climate. But there are marked points of difference between the seasons of New Zealand and Italy. Thus, in Italy there is a sort of summer winter, when cattle must be provided for indoors as in winter, and during which for several hours of the day all out door work is interrupted by heat. There is no similar summer winter in New Zealand, and, it is the opinion of persons who have sojourned in different parts of the world that the Anglo-Saxon race can work and expose themselves to the climate of New Zealand without injury during more days in the year, and for more hours in the day, than in any other country.

With regard to the temperature, it may be inferred from the observations which have been made that the climate of the interior is warmer in summer, and colder in winter, than around the coast. These observations show that the mean annual temperature of the North Island of New Zealand is 57° Fahr., and of the Middle Island 52°. January and February, which months correspond to July and August in England, are the warmest months in New Zealand—and June and July, corresponding to December and January, are the coldest. Rome, Montpellier, and Milan, possess climates having nearly the same mean annual temperature as the North Island of New Zealand, and Jersey, one of the Channel Islands, in this respect resembles the Middle Island. The climate of London is 7° colder than the climate of the North Island, and 2° colder than the climate of the Middle Island. In New Zealand the nights are about 12° colder than the days. The mean daily range of temperature is under twenty, and the extreme range is occasionally upwards of 30°. Great variations of temperature are more common in the Middle Island than in the North. The mean temperature of places in New Zealand is lower than that experienced in corresponding latitudes in Europe, but the temperature there is higher than that experienced in corresponding

latitudes in America. It may be observed that no single locality in Europe has a temperature during the whole year like New Zealand. The North Island, in short, possesses the summer heat of Paris, Brussels, and Amsterdam, with the winter cold of Rome; while the Middle Island has a Jersey summer, and a winter in coldness resembling that of Montpellier. The difference between the mean temperature of the coldest and warmest months in the year in New Zealand is about 20 degrees: at Rome it is 27° , at Montpellier 33° , at Milan 38° , and at Jersey 22° , while New York and Quebec, placed in the same latitudes as Wellington and Otago, experience tropical heats in August and polar colds in January. Snow seldom lies on the ground at the level of the sea in the North Island, and not very often in Middle Island. But all round the year, the summit of Ruapahu, the highest mountain in the North Island, and the great mountain chains in the Middle Island, are covered with snow. Ice is occasionally seen in winter from one extremity of New Zealand to the other, but frosts are comparatively slight to the south of Auckland, although the North Cape is occasionally covered with hoar frost. An idea of the mildness of the climate at Nelson and Canterbury, in the Middle Island, may be drawn from the fact of sheep frequently lambing in midwinter with no greater loss than five or ten per cent.

With reference to the power of the solar rays, it is stated that, in the month of December, 1856, at Auckland, the sun's rays indicated a temperature of 99° Fahr. During the years 1849, 50, and 51, some observations were made on this subject at Auckland, and it was found that the mean maximum temperature of the sun's rays during the summer months was about 101° Fahr. On one cloudless calm day in February the thermometer rose to 124° , and during the same months on the banks of the Waikato river, in the interior of the North Island, to 126° . The greatest intensity of the rays occurred from noon until half-past two, when the sun was decreasing in altitude. But this stream of heat from the sun during the summer is not of daily occurrence, for even at Nelson, perhaps the most sunshiny part of New Zealand, there are about ten days in every summer month during which the sun is more or less veiled with clouds. The heat of the sun, in consequence of the winds and moisture in the atmosphere, is comparatively not much felt, and cases of Coup de soleil, a malady not unusual in New South Wales, are here extremely rare. It is probable, from the intensity of the sun's rays in sheltered spots, that grapes and other fruits ripen at places in New Zealand where the registered summer temperature is not sufficiently warm to produce such fruits.

It appears that the fall of rain in New Zealand was greatest at New Plymouth and least at Otago, and that more rain falls, and the number of rainy and showery days is greater in the North Island than in the Middle Island. Great irregularity, however, occurs all over the country in the monthly and annual quantities of rain falling in different years, but there is no doubt that most rain falls in winter. There is, in fact, no proper wet and dry season in New Zealand; fourteen days seldom pass without rain, and it rarely continues for three successive days. Heavy rains occasionally occur, although slight when compared with those experienced on the Australian continent. Upwards of 3 inches of rain fell in 24 hours at Auckland in March 1853, and $3\frac{1}{2}$ inches once fell at Nelson in eight hours. The temperature of the rain is sometimes above and sometimes below that of the air. From the facts recorded, it results that more rain falls there than in London, but much less than that occurring on the west coast of England.

No observations are recorded on the moisture in the atmosphere, but, from some experiments made in 1849 and 1850, it was found that more moisture was suspended in the atmosphere at Auckland than in the atmosphere surrounding London. Persons not conversant with me-

teorological observations will find proofs of the presence of this moisture in the luxuriansness of the vegetation in New Zealand, the heavy night dews, and the mould which collects on unused shoes and wearing apparel. But this moisture in the climate must not be confounded with raw dampness. It produces an exquisite softness of the skin, and settlers rarely have that unpleasant glazed feeling of the skin so often experienced in dry climates. This moisture in the climate is produced by the evaporation continually going on during dry weather from the South Sea, and it is only necessary to remember that New Zealand stands in the centre of the greatest expanse of ocean in the globe to perceive the powerful influence of this cause.

In probably no country in Europe is the atmosphere so frequently agitated by winds. The mean pressure of the wind at Auckland is nearly a pound on the square foot, and the strongest wind yet registered at Auckland exerted a pressure of $35\frac{1}{2}$ lbs. on the square foot, equivalent to a velocity of 84 miles per hour. A gale is indicated by a velocity of 50 miles an hour. The wind increase in force and frequency as we advance southwards from Auckland. Cook and Foveaux Straits are celebrated for stiff breezes and gales. At Nelson, standing at the bottom of Tasman's Bay, 14 gales, on an average, occurred annually. All round the coasts a sea breeze occasionally blows in summer.

In several places on the eastern coast, where there are mountain chains ascending about 3,000 feet above the level of the sea, a hot wind is occasionally experienced in summer. This hot wind melts the snow on the mountains of the Middle Island, swells the rivers from these sources, and, rushing down on the plains in different directions, according to the shape of the valleys, raises the thermometer 20° or 30° . Fortunately the vegetation this hot wind is generally the precursor of rain. On one occasion, on the Canterbury plain, a thermometer exposed to this wind rose to 113° Fahr. Different theories have been propounded as to the cause of this wind. It is probably an elevated current of the hot wind from the Australian continent, which is interrupted and directed downwards on certain places by the high mountains, while the lower current of this Australian hot wind is generally, but not always, entirely cooled by passing over the surface of the sea before reaching the western coasts of New Zealand. That this hot wind is not produced by the plains of New Zealand is almost proved by the wind being as warm at the foot of the snowy range on the Canterbury plain as at the coast. That it is derived from Australia is inferred from vessels sailing from New Zealand to Sydney having been kept back for days a long distance from the Australian coast by hot winds, and from the occasional, although rare occurrence, of a wind of about 70° being experienced at Auckland and other places on the western coast of the North Island when westerly winds with fine weather have been blowing for several successive days in summer.

According to the observations made, the air exerts greater pressure over the North Island than the Middle Island. The influence of the wind on the atmospheric pressure has been observed all round the coasts, in one locality depressing, in another raising the barometer. The winds, unless of considerable force, are so modified by the shape of the islands that they are nothing but eddies from the greater polar and equatorial currents. Generally wind from the equator, which brings rain, depresses the thermometer, and southerly or polar winds, accompanied with fine weather, raise it. In the neighbourhood of high mountains, for example the Fakoras, in the Middle Island, the barometer occasionally moves without an obvious atmospheric disturbance.

During eleven years there were registered at Nelson: solar haloes, 20 lunar haloes, 5 extraordinary tides, and 55 earthquakes. Excepting the last phenomenon above may be taken as an average for the whole of New Zealand. The earthquake region comprehends a space

of about 350 miles, or that portion of the country lying between White Island, latitude $37^{\circ} 30'$ and Banks Peninsula, latitude $43^{\circ} 46'$, having Cook's Strait for its centre. All earthquakes registered since the arrival of the settlers have been slight save those of 1848 and 1855. The atmosphere on the sea coast is not much disturbed by thunder storms, but in the neighbourhood of high mountains these phenomena are more frequent. At Nelson on an average of eleven years twelve thunder storms occurred annually, and at New Plymouth seven. Fogs are rare in the northern parts, but they increase in frequency and duration as we advance southwards. Hail storms occur. The Aurora Australis is occasionally seen from the Middle Island. Shooting stars are not so frequent as in England, and the heaven is rarely lit up with meteors of any brilliancy.

THE ATLANTIC TELEGRAPH.

The following is the report of Mr. C. T. Bright, the engineer in chief of the Atlantic Telegraph Company, in reference to the proceedings during the paying out of the cable from the *Agamemnon* :—

"To the Directors of the Atlantic Telegraph Company.

"GENTLEMEN,—On arriving at Valentia on the morning of the 5th inst., I forwarded to you by telegraph a brief report of the success which has attended the Company's endeavours to place Newfoundland in electrical communication with Ireland, and I have now the honour to lay before you fuller particulars of the operations carried out on board Her Majesty's steamer *Agamemnon*, which I have been unable to do sooner, owing to the pressure consequent upon the return of the expedition.

"After our departure from Queenstown, at 2 a.m. on the 18th ult., we proceeded towards the rendezvous, which we reached on the night of the 28th, having been delayed by contrary winds and a head swell. We found the *Niagara*, *Valorous*, and *Gorgon*, which had left Queenstown on the 17th, waiting for us; and on the morning of the 29th, the sea being smooth, and the barometer standing at 30.15, the *Agamemnon* and *Niagara* were connected together by a hawser stern to stern; the end of the cable on board the latter ship was then brought by the boats of the *Valorous* to the *Agamemnon*, where the splice was finished by 1 o'clock, local time, our position then being lat. $52^{\circ} 8' N.$, long. $32^{\circ} 27' W.$, distant 38.3 statute, or 81.5 nautical miles from the White Strand Bay at Valentia.

"Having veered out a sufficient length to bring the splice into the centre of the curve formed by the cable angling between the ships, the hawser was released, and we proceeded in our course slowly, paying out slack reel for the first three hours, after which the speed of the ship was increased to four, and at 7 p.m. to five knots per hour.

"All went on well until 7.45 p.m., when, immediately after passing from the outside to the centre of the coil in the main hold, the beginning of the first turn of the cable next below that in process of delivery was seen (on being exposed by the uncoiling of the cable above it) to be squeezed between the side of the cone in the eye of the coil and the end of the piece of wood by which the leading in part of the coil was defended.

"This injury occurred through the extent to which the coil was disturbed during the gales encountered in our previous voyage, and although the whole of the upper part of the coil which had been displaced to such an extent as to promise any difficulty in paying out was removed, and coiled on the upper deck abaft the fore-mast, it would appear that all the new cable which had been lately placed on the top of the main coil had shifted somewhat in the heavy weather, for it was necessary to

rectify another defect, arising from the same cause at a similar part of the coil soon after.

"The old cable, which had been coiled for a longer time, and was more thickly coated with the mixture of tar and pitch, was not in the least degree disturbed.

"When the defective piece had been passed under some of the turns of the flake, then paying out to the outside, in order to allow of more narrow examination than could be made in the centre of the coil where the cable was passing out of the hold, Professor Thomson reported that continuity had ceased.

"On the cessation of signals I requested Captain Freedy to stop the ship, having placed Mr. Clifford to superintend the machine, so that as little cable might be paid out as was consistent with safety, Mr. Canning taking charge of the reinstatement of the injury, while M. Hoar attended to the dynamometer.

"It is in great measure owing to the care of these gentlemen that no ill resulted from this critical mischance.

"At 9.15 the fault was repaired, and shortly afterwards signals were again reported from the *Niagara*. We had at this time paid out 46 nautical miles of cable from the *Agamemnon*.

"The depth of water at the time of this stoppage was 2,030 fathoms, according to the nearest sounding.

"By noon on the 30th we had paid out 135.8 nautical miles, being then in lat. 52.24 , long. 29.50 , by observation, and 718 miles distant from Valentia, the *Niagara* having laid 130 miles of cable.

"After this the wind freshened, and a heavy swell got up, increasing the motion of the ship very much, and at midnight it was blowing hard from south-south-east, the consumption of coal required to keep up the speed which I desired to maintain being so great that some apprehension was felt in regard to the sufficiency of our supply of fuel.

"At noon on the 31st, the *Agamemnon* had paid out 280 miles, and the *Niagara* 285.

"The weather did not allow of any observation, but our run by dead reckoning made us about 605 miles from Valentia, and in the locality where the depth of 2,400 fathoms (the greatest in our route) was obtained by Captain Dayman, in Her Majesty's ship *Cyclops*, last year.

"During the day the wind continued to blow heavily, the sea running very high. By midnight the barometer had fallen to 29.50, and everything indicated a change for worse, rather than for better, weather. We had then paid out 365 miles of cable, the *Niagara* 365.

"At noon on Sunday, August 1, we were 478½ miles from Valentia, our position by observation being, lat. $52^{\circ} 26'$ min. 30 sec., long. $23^{\circ} 16'$ min. 30 sec., 434 miles having been paid out from the *Agamemnon* and 440 by the *Niagara*.

"During the morning the wind had changed to the south-west and the weather gave signs of amendment, but a heavy swell remained, and in the afternoon the breeze freshened, squalls followed each other in rapid succession, and the ship pitched as much as before.

"By noon on the 2nd we were in lat. 52.35 , long. 19.48 , 351.6 miles from Valentia, 605 miles of cable having been laid from the *Agamemnon* and 615 from the *Niagara*.

"In the afternoon the force of the wind decreased and the motion of the ship was much easier. At 3 p.m. we had to alter our course for a few minutes to avoid a three masted schooner, which passed us on the port bow so closely as to make it a subject for congratulation that she did not cross our path astern; the cable grew out very much to the starboard side during the change, but I caused an additional amount of slack to be paid out at the time, so that no undue strain came upon it.

"During the evening the weather was squally, and by 4 o'clock in the morning of the 3rd the wind had got round to the north-west, and a long slow swell from the south-west caused the ship to pitch and roll as much as before. At this time some excitement was created by

bark bearing down upon our starboard beam; we increased speed to clear her, but she hove to on being intercepted by the *Valorous*.

"At noon on the 3rd we had paid out 776 miles of cable, being then in lat. 52 deg. 26 min., long. 16 deg. 7 min. 40 sec., 212·2 miles from Valentia, the *Niagara* having laid 780 miles.

"After the depth of water, which had averaged 2,000 fathoms since the 1st inst., began to lessen, and at 5 p.m. the greatest variations in our track (from 1,750 to 550 fathoms within about 10 miles) occurred; an extra per centage of slack being laid to provide for any irregularities which might there exist in the bottom. By midnight the depth had further increased to 216 fathoms.

"At 4 a.m. on the 4th the large coil in the main hold was exhausted, and we commenced paying out from the upper deck coil.

"By noon the water had deepened again to 400 fathoms; we were then in lat. 52·11, long. 12·40, only 89½ miles from Valentia, having laid 924 miles of cable, while the *Niagara* had laid 925.

"During the day the wind and sea dropped, and at 8 p.m., having reduced our distance from Valentia to 50 miles, the *Valorous* steamed ahead to make out the land.

"The water now shoaled gradually. At 8·30 p.m., having finished the second coil, a change was effected to the cable on the orlop deck.

"At midnight we were in company with the *Valorous* in sight of the Upper Skellig light, and at dawn on the morning of the 5th, abreast of the Blasquets, steaming slowly towards Valentia.

"At 6 a.m. we anchored in Douglas Bay, 2,022 nautical miles having been paid out between the two ships, and proceeded to coil a sufficient length of cable to reach the shore into one of the paddle-box boats of the *Valorous*.

"The wind freshened in the course of the morning, by which the landing of the end was somewhat delayed, the swell becoming so great that Captain Preedy got up steam in the *Agamemnon*, ready to put out to sea at any moment.

"At 3 p.m. the end of the cable was safely brought to the beach, and passed into the Company's station.

"The strain upon the cable varied during the paying-out under different circumstances of weather, depth of water, and speed of ship, as will be seen by the accompanying tabular log, which furnishes details recorded several times in each hour of the indicated strain, weight on breaks, angle of cable, rate of paying out, rate of ship, revolutions of screw, distance run according to Masey's log, distance made good by observations, and a journal of all the events worthy of note in each watch. An entry is also made of Greenwich time, so that the electrician's diary and the log kept on board the *Niagara* may be more readily compared with it.

"Some inconvenience was experienced by the great accumulation of pitch and tar, a second coating of which was laid on the cable when coiled away at Keyham for the winter, to prevent it from rusting, but this had also its advantage, in keeping down the cable leading from the coil, which had, if too dry in any place, a tendency to fly out when running at a high speed.

"The paying-out machinery (consisting of the addition of Mr. Appold's brake to one of the two machines fitted on board each ship last year, as recommended by your committee, with the dynamometer, for indicating the strain), has worked exceedingly well, in a manner which reflects the highest credit upon the manufacturers, Messrs. Easton and Amos.

"The handwheel for lifting the weights when required, designed by Mr. Amos, was of considerable service during the unfavourable weather which prevailed for the chief part of the voyage.

"The amount of slack paid out amounted to 227° upon the distance run. Less might have been laid, but I considered it desirable to insure the cable laying everywhere

on the bottom—that ample slack should be used to cover any irregularities within bounds of probability.

"I must not conclude this report without again expressing my deep sense and appreciation of the laborious and untiring patience exhibited by Capt. Preedy and the officers and company of the *Agamemnon*; nor can I too strongly express my obligation to Mr. Canning and Mr. Clifford, who so ably took part with me in the general superintendence of the work, and to Mr. Har and Mr. Moore, whose supervision of the dynamometer and machinery was of the utmost value to us; and it must not be forgotten that Capt. Hudson and the officers and crew of the *Niagara*, with Mr. Everett and Mr. Woodhouse, who had charge of the operation of paying out from the *Niagara*, with the assistance of Mr. Kell, have also performed their share of the labour equally with those who have returned to Ireland in the *Agamemnon*.

"I have the honour to remain,

"Your most obedient servant,

"CHARLES T. BRIGHT, Engineer.

"22, Old Broad-street, Aug. 19."

ARSENIC IN PAPER-HANGINGS.

In the *Journal*, Vol. V., p. 652, reference was made to the evidence of Dr. Alfred Swaine Taylor, given before a Committee of the House of Lords on the "Sale of Poisons Bill," in which he spoke of the injurious effects of paper-hangings coloured with arsenite of copper. Some of the rooms in the new offices of the Inland Revenue Department being hung with these papers, and the attention of the Commissioners having been called to the circumstance, they directed Mr. Phillips, the chemist to the Board, to investigate the subject.

The following is the report:—

"In the *Pharmaceutical Journal* for February last, page 429, it is stated that Dr. Halley, of Harley-street, had detected arsenious acid in the atmosphere of his study, the walls of which were covered with green paper, and that the test he employed was 'sheets of paper soaked in a solution of ammonia-nitrate of silver,' and that upon this paper were deposited numerous well-defined crystals of arsenious acid, visible under a low power with the microscope, and that the form of these crystals precluded the possibility of a mistake.

"Ammonia-nitrate of silver is a test of arsenious acid, but not in the manner which Dr. Halley seems to suppose, as it does not cause the deposition of crystals of arsenious acid (which are colourless), but produces a bright yellow precipitate of arsenite of silver, provided the amount of ammonia present in the test be very exactly proportioned to that of the nitrate of silver. If such be not the case, no precipitate is produced. These particulars are mentioned because Dr. Halley appears to have resorted to any other test, but to have concluded merely from the appearance of the crystals formed on his test paper, and without analysing them, that they must be those of the poison in question.

"In the following experiments, made with a view to test Dr. Halley's conclusions, the interior surfaces of two closets were covered with green paper similar to the pattern annexed.

"Closet A had a capacity of 17 cubic feet, and was lined with about 48 square feet of the paper, or 2·8 square feet to each cubic foot of space.

"Closet B had a capacity of 26 cubic feet, and was lined with 58 square feet of paper, or 2·0 square feet to each cubic foot of space.

"These closets had no means of ventilation beyond

the chinks round the doors; the included air, therefore, would remain much longer in contact with the paper than would be the case in an ordinary room. The surface of the paper to the bulk of air enclosed was not less than fourteen times as great as it would be in a room 20 feet square and 12 feet high, thus showing that the conditions of the experiments were highly favourable to the impregnation of the air with arsenious acid, if such were possible. In each of these closets were placed two basins, one containing a solution of potash, the other ammonia-nitrate of silver, and a sheet of paper saturated with the latter reagent. Closet A was kept as much as possible from the influence of common gas. In closet B gas was allowed to burn during the day-time, the temperature of the included air being kept by the flame at from 74° to 82° F. The closets were carefully closed for 72 hours, the gas burning during that time 45 hours in closet B. The solutions of potash and ammonia nitrate of silver from each closet were then examined by Marsh's test, which is by far the most delicate known, and found to be quite free from arsenic.

"The sheets of paper saturated with ammonia-nitrate of silver were also free from arsenic, but had on their surface numerous colourless crystals which, when analysed, proved to be nitrate of silver, the evaporation of the water from the test-paper having concentrated the solution with which the paper was saturated to such an extent as to cause the nitrate of silver to crystallise out. On the test-paper was also found an amorphous substance having a dingy yellow colour, which speedily became black on exposure to light; the same substance was also observed on the surface of the ammonia-nitrate of silver contained in the basins, being most abundant in that which had remained in closet B, in which gas had been burnt. When analysed it was found to be sulphide of silver, the sulphur, no doubt, having been derived from the atmosphere of the laboratory, which always contains traces of sulphuretted hydrogen. This dingy yellow substance, which, without analysis, might be supposed by some to be arsenite of silver, was formed in a third closet, in which no arsenical compounds were present, thus proving that the green paper had no share in its production.

"The green paper used in the experiments is coloured with what is known as emerald or Schweinfurt green, which is a compound of arsenite of copper and acetate of copper. The paper contains 11·8 grains of arsenious acid to the square foot.

"The following conclusions may fairly be drawn from the experiments above described:—

"1st. That even when a small bulk of air is allowed to remain for a considerable time in contact with a large surface of the arsenical paper, and that so at a temperature of 80° F., not the slightest trace of arsenious acid is diffused in the air. Still less might the air of an ordinary room, which occupies a large space in proportion to the surface of the walls, and which is being constantly changed by ventilation, be expected to become contaminated by the poison.

"2nd. That the products of the combustion of gas do not facilitate the liberation of arsenious acid from the surface of the green paper.

"3rd. That arsenious acid is not volatilised from the surface of such paper except at temperatures too high for human endurance.

"It is probable that persons may have been affected by habitating rooms papered with arsenical hangings, not because the arsenious acid has been volatilised, but from an improper and frequent sweeping of the walls, by which minute particles of arsenite of copper might be detached from those portions of the surface of the paper which were not glazed, and becoming dispersed in the air, get inhaled by persons occupying the room at the time. This only source of danger, which might be obviated by a little management in the cleaning of a room, & caution in the selection of a paper having but a little

of its surface unglazed, appears not to have presented itself to the mind of Dr. Halley, who seems to have been possessed with the idea that injury to health was to be apprehended solely from the vapourisation of the arsenious acid. Dr. Taylor, on the other hand, ascribes the danger to the fact that the colour is 'put on very loosely,' and, therefore, by inference, easily detached and disseminated through the air, not as vapour of arsenious acid, but as minute particles of arsenite of copper.

"The subject under consideration being one of much importance, I have felt it necessary to enlarge upon it, and as Dr. Halley's statement is calculated to create an apprehension of danger which I believe has no existence, I beg to make the following remarks:—

"Dr. Halley states that on two occasions distinct crystals of arsenious acid were deposited on the surface of his test-paper from the air of his room. It is more than probable that if he had analysed the crystals, and not assumed their composition from their appearance under the microscope, he would have found them to be nitrate of silver. The test-paper which he used had no more effect in causing the deposition of crystals of arsenious acid than any other surface in the room would have, and to suppose that crystals of the poison were thus deposited, would be to imply that the air was impregnated with arsenious acid to an extent which must be fatal to persons inhaling it for a short time. Notwithstanding his statement that the air of his room furnished crystals of arsenious acid, he subsequently says that, at ordinary temperatures, with common atmospheric air, even when an aspirator was used, the amount of arsenic given off was 'inappreciably small,' omitting to mention what test he employed to detect a quantity not appreciable. The purport of his remarks, however, appears to be that arsenious acid, to an appreciable extent, is only given off from arsenical paper in rooms in which gas is burnt, and that the products of the combustion of the gas combine with the arsenic in the paper. If such be the case, it is difficult to conceive how the arsenious acid can be deposited from the air of the room in a free and crystalline state.

"It may be proper to mention that I and my family occupied a sitting-room three years, the walls of which were covered with paper heavily laden with arsenite of copper, and that for the same period my bed-room was also papered with arsenical hangings, yet neither I nor any member of my family experienced the slightest ill effect from such paper.

"In conclusion, I beg to express my opinion that no danger need be apprehended from a paper such as the one annexed, in which but a small proportion of the surface is unglazed, provided ordinary care be used when removing the dust from the walls, and that even if such care were not exercised, it is doubtful whether any pernicious effects would be felt by those inhabiting the room."

FRENCH WINE DISTRICTS.

The following is a summary of information collected in the principal wine-growing districts of France:—

"Alby.—The vineyards are flourishing; the oidium has caused but little injury, and an abundant vintage is expected.

"Blois.—The black grapes are beginning to ripen; the white grapes are nearly ripe; the appearance of the vineyards is perfectly satisfactory.

"Bourg.—The vineyards are in the best condition—the grapes are beginning to ripen.

"Cette.—The continued dry weather has prevented the growth of the grape, and we require great rain to repair the injury. The oidium had made its appearance, but was arrested by the sulphur applied to the vines.

"In the Gard the vineyards are magnificent, except in some elevated positions, where the grapes are suffering from the drought.

"Corrèze.—The vintage will be as early this year as in 1822. We expect to drink new wine towards the 15th September.

"Limoges.—The cold weather has retarded the growth of the grape; nevertheless we expect an abundant vintage.

"Marennes.—The vines are progressing admirably; the grapes are visibly increasing in size. There is no disease.

"Montelimart.—The appearance of a good vintage has produced a fall of 2f. the hectolitre. The price is now from 20f. to 22f. the hectolitre.

"Tarbes.—The vineyards are in the best possible condition. There will be an abundant vintage, and consequently empty casks are selling exorbitantly high."

SOUTH KENSINGTON MUSEUM.

During the week ending 21st Aug., 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,025; on Monday and Tuesday (free evenings), 4,520. On the three Students' days (admission to the public 6d.), 662; one Students' evening, Wednesday, 92. Total, 8,299. From the opening of the Museum, 561,948.

Home Correspondence.

PAPER DUTY.

SIR,—The *Journal* of the 20th inst. contains an extract from the last report of the Commissioners of the Inland Revenue, which appears to me calculated seriously to mislead the reader, and I therefore ask leave to make a few remarks. The contents of the extract may be summed up in these assertions:—

1st. That the duty does not unduly restrict the manufacture or oppress the manufacturer.

2nd. That the commissioners are continually adapting their regulations to the wants and wishes of the manufacturer.

With regard to the first assertion, I affirm that the tax renders nearly twice as much capital necessary to carry on the trade of paper-making as would otherwise suffice. Let the government now lay a tax on the manufacture of iron, or on the manufacture of cotton or wool, which should render 100 per cent. more capital necessary for the same amount of production, and see what would be the result. Cotton and iron now rank first amongst our manufactures, but such an enactment would annihilate them. The rise of one-eighth of a penny per pound of cotton ruins manufacturers, and largely increases pauperism. What would a law which should practically double its price do?

But straw (of which a large amount of paper is made) is taxed 600 per cent. Is not that an undue pressure? Coloured rags are taxed 300 per cent. Is not that a restriction? In free trades if a man makes a bad debt and appeals to his creditors, they, if convinced of his honesty, generally accept a composition, but if a paper manufacturer fails to the government, they seize for twice as much as he owes; is not that undue pressure?

The Commissioners point as a proof of their assertion to the fact of increased exports, but they do not point out the fact that we import as much paper as we export.

We fetch cotton wool from America, from India, from South and West Africa, manufacture and return it at less prices than it can be produced for in the countries where it grows; but in paper, the produce of cotton and linen waste, we are beaten by France, Prussia, and America.

What possible reason is there for this result except the hindrances in the way of the manufacturer, and the fact that the simple charging and uncharging, with the separate packing necessary for export, appreciates the cost price at least 5 per cent., and is, therefore, really an export duty.

In what other staple trade can it be shown that the number of manufacturers has decreased from 30 to 40 per cent. within the last 20 years, and what but undue pressure could have brought about such a result? The assertion of the Commissioners is an apt illustration of the fisherwoman with the skinned eels; skinning does not hurt the paper-makers, they are used to it.

To the second assertion of the Commissioners, I say there is no denying that the 48 hours detention in the mill after charging is now reduced to two, and they now allow paper to be made up in parcels as well as in reams, and these are doubtless useful concessions. But if an unfortunate maker who has been all day writing the word "ream," happens to do so where he ought to write "parcel," he loses his paper. Many of the government offices use weighing machines to economise time, but the Commissioners demand the old fashioned scales and weights, thereby quadrupling the time necessary for the operation, and they are deaf to reason.

The whole number of drawbacks amount to seven, and the Commissioners take great credit for that on envelope cuttings; but they admit that the advantage of exemption was given to paper-makers in 1850, whilst the equality to stationers was only restored in October, 1855. This does not say much for the pliability of the board: especially as they have since refused a similar allowance on the cuttings from writing paper used in the manufacture of copy-books.

The mischief of the paper tax spreads itself over other trades. For instance, a large section of the markets for sewing cotton require it wound upon cards of millboard. Now such cards are produced in Prussia at less than one-half of the English price, and so large is the quantity of pasteboard to cotton, that the duty on the paper appreciates the cost of the cotton by 5 per cent. The Commissioners refuse to allow a drawback on the paper thus used, and the consequence is that Manchester merchants purchase sewing cotton at Barmen, import it in transit to Hull, and re-export it to South America and other ports. This is a proof of how the Commissioners adapt their regulations to the wants and wishes of the trade.

Paper as it comes from the rollers is just in a fit state to print, and the proprietor of the *Illustrated London News* proposed some time ago to take advantage of this circumstance, and to use the same steam power for printing books, and he would even have been willing to pay the tax upon the ink used, but the board refused the concession.

These are a few of the trade restrictions and oppressions, and ought to be known to all who read the report of the Inland Revenue Commissioners, but the great aim for the repeal of the paper duty is the educational one. The tax on the "Irish schools lesson-books" is 12½ per cent. on the cost, "but," says Charles Knight, "the tax is doubled by the paper-maker." Now, if we assume that the paper-maker and the publisher double it between them, we are then justified in saying that for every hundred lesson books which would be printed, the Government steps in and restricts the issue to 75, thus keeping 25 children without instruction for every 75 taught. And in newspapers a great effort is at present making to universalize intelligence by means of penny papers. One of them, I am told, circulates 50,000 copies per day, and the government taxes their raw material 600 per cent., amounting to a fine of £50 per day for giving knowledge to the people. To me it seems that if the Commissioners would only accommodate the trade by throwing their regulations in the fire and leaving manufacturers entirely alone, they would adopt the only possible mode of ceasing to restrict trade.

trader. I enclose an estimate of the probable results of the repeal of the duty. I am, &c.,

JOHN WATTS.

Whalley Range, Manchester, 21st Aug., 1858.

PROBABLE RESULTS OF THE REPEAL OF THE PAPER DUTY.

The repeal of the excise upon paper would set at liberty a million of money per annum, now paid in duty, and half a million invested in paper extra, as profit on the tax. This new fund would seek productive employment in paper-making or other industry, and, if turned over twice per year, would give 20s. per week each to 57,692 workmen, who, as heads of families, would represent 230,768 individuals.

The extra production would cause extra imports, extra Customs and Excise Duties, so that the repeal would not, even in the first year, be a total loss to the government.

Here is a table of articles subject to duty, with an estimate of the consumption of one working-class family per annum, and the duties receivable thereon:—

Corn, $4\frac{1}{2}$ qrs.	£0	4s.	6d.
Butter, $\frac{1}{2}$ cwt.	0	2	6
Sugar, $\frac{1}{2}$ cwt.	0	7	6
Molasses, $\frac{1}{2}$ cwt.	0	2	8
Tea, $6\frac{1}{2}$ lbs.	0	9	$2\frac{1}{2}$
Coffee, 13 lbs.	0	4	4
Cheese, 56 lbs.	0	1	3
Tallow, $\frac{1}{2}$ cwt.	0	0	9
Spirits, $1\frac{1}{2}$ gall. (proof)....	1	2	6
Tobacco, 6 lbs.	0	18	0
Beer, 3 barrels, any	1	0	0

£4 13 2 $\frac{1}{2}$

Many articles subject to duty are here omitted, which would add to the amount; but suppose we assume the average at £4 10s. per family,—then, $57,692 \times 4\frac{1}{2} = £259,614$, which would be paid in extra Customs and Excise Duties to the Government. But manufactured produce does not find its way to the consumer at less than 33 per cent. of profit to the manufacturer, the wholesale and retail dealer.

One million and a half of money turned over twice per annum, would therefore leave about £999,999 extra subject to Income Tax, which, at 7d. in the pound, would give £39,164, which, added to the extra Customs and Excise, makes a total of £288,778. This is the probable result of the first year of repeal.

In the second year, the extra capital for productive employment would be, first, the £1,500,000 saved in the first year; second, £999,999 profit realised thereon; and third, £1,500,000 saved for the current year. Thus £3,999,999 would be ready for occupation, and, reckoning the extra Customs, Excise, and Income Tax upon this investment as formerly, it would be £288,778 $\times 2\frac{1}{2} = £770,074$.

In the third year, the extra capital would be, first, £3,999,999; second, £2,666,666 profit realised thereon; third, £1,500,000 saved for the current year. Thus £6,166,665 would be ready for occupation, and, reckoning the extra taxation upon this as formerly, it would be £288,778 $\times 4\frac{1}{2} = £1,333,989$; being, in the third year, more than the sum now collected as duty on paper.

MECHANICS' INSTITUTIONS AND SECONDARY EDUCATION.

SIR,—Almost everybody thinks it desirable to continue the education of boys beyond the period at which they usually leave school. To do this there must be some strong motive to exertion, and this motive must be the prospect of some pecuniary benefit. No virtue manifests itself more strongly among the thoughtful portion of the working classes than a desire to provide against that period when they are no longer able to work.

Between three and four millions of the operative classes belong to Provident Societies. Some of these societies grew out of the small provincial clubs originally established to enable the members to visit the Great Exhibition, showing that the first five shillings saved often lays the foundation of future providence and economy.

In looking over the results of the Society of Arts Examinations, I find that nearly 85 per cent. of the Candidates were under 25 years of age. Beyond this age I do not think it reasonable to expect much mental effort, except in the case of those whose minds have been early disciplined either by good teachers or good parents.

The formation of character and the general habit of mind will depend chiefly on the associations between that time when a boy leaves school, and the period when he becomes occupied with the cares and responsibilities of a family.

If anything is done for the secondary education of the working classes, it can only be done as a rule up to the age of 25 years, and by the adoption of a simple organization with a view to some practical benefit within the reach of those who choose to make the effort.

The only safe principle upon which we can act in education is to help those who are anxious to help themselves, and with this view I would suggest a system of examinations, the award of certificates, and the payment of small annual amounts on the results of those examinations. The following table will help to illustrate the idea:—

GROUP I.

Writing from Dictation.

	3rd class.	2nd class.	1st class	as
	s. d.	s. d.	s. d.	
Arithmetic	2 0	4 0	6 0	0
English History and Grammar	2 0	4 0	6 0	0
Geography (Descriptive) for the 2nd and 3rd Certificate, and Physical for the 1st	2 0	4 0	6 0	0

GROUP II.

	3rd class.	2nd class.	1st class	as
	s. d.	s. d.	s. d.	
Algebra	2 6	5 0	7 6	0
Applied Mechanics	2 6	5 0	7 6	0
Geometry	2 6	5 0	7 6	0
Physics (Experimental).—Heat, Pneumatics, Hydrostatics, Electricity, and Magnetism	2 6	5 0	7 6	0
Chemistry	2 6	5 0	7 6	0
Drawing	2 6	5 0	7 6	0

The writing from dictation should be an absolute preliminary condition of examination, in any of the succeeding subjects, and the lowest or third certificate, in Group I., should be taken before any certificates were given in Group II., and these might be taken in any order convenient to the candidate, not exceeding three in one year. The only condition of examination should be a certificate from a teacher that the candidate had attended 40 hours instruction during the year in each of the subjects in which he proposed to be examined, and that he was engaged in some industrial occupation. If the principle of pecuniary aid be admitted, the rate of payment and the subjects are mere matters of detail. The money paid on these certificates should be placed to the account of the candidate in some approved Provident Society, either towards purchasing an annuity, assisting emigration, if this be thought desirable, or as a bonus at a certain period. The money should in no case be paid as a direct pecuniary reward. I think such a system of encouragement open to serious objections. The successful candidate should be encouraged to increase his certificate money by his own savings, and I believe, in many instances, the employers would give something themselves. I am not insensible to the objections which will be used against such a scheme; I have carefully considered the matter in all its details, and I shall be glad to hear an objection that can be urged against it. I give the plan publicity for the purpose of discussion, and I hope this communication will not be

passed over with the same indifference as many subjects which appear in the *Journal*.

I am, &c.,
J. C. B.

MECHANICS' INSTITUTIONS.

SIR,—The time is now approaching when, from the shortening of the days, the operations of Mechanics' Institutions should be commenced with earnestness, and it therefore behoves the respective managers to use every exertion in order to promote the due efficiency of their several Institutions, and their labours may be lightened by the conviction that judicious management at the commencement of a season spares much trouble afterwards.

Amongst the many schemes which have been devised for exciting public attention, there are few which have been so successful as a festive gathering, which, under the name of a *soirée*, affords an opportunity for making known the advantages of an Institution to very many who might otherwise not even be aware of its existence. If diligence be used in canvassing the locality, and any interest be taken in it by the resident gentry, there is not only the advantage of bringing all classes of the community into friendly union, but of contributing that pecuniary aid, the want of which is often so severely felt. But beyond all this the platform furnishes the opportunity of placing before a numerous audience the benefits to be obtained in a more attractive manner than could be otherwise accomplished. Prospectuses, essays, and pamphlets, may do much, but there is the difficulty of getting them read; and if this were overcome, they are by no means equal to the persuasive influence of the human voice when the hearers have come prepared to listen to the advocacy of mental cultivation for the promotion of moral and social welfare.

For full effect, however, to be given to such a demonstration, it should be followed by an active canvass of the locality, so that the most lukewarm should not have the excuse that they were never asked to contribute by a subscription to the success of the Institution. In every town there are many to be found who would not refuse to pay a small subscription, and who yet do not feel sufficient interest to take the trouble of searching out the proper officer, and tendering their assistance. The good work will also be additionally promoted by the employment of a regular collector, to be remunerated by a commission on his receipts. These, it may be said, are but helps to raise funds, but the want of funds is the paramount difficulty with the majority of Institutions, and if this difficulty were surmounted, an active committee of average intelligence would be enabled to place such attractions before the public as would materially aid in increasing their means of practical usefulness.

Another means of publicity is afforded by lectures, whether occasionally or at regular intervals. In Lancashire they profess to see no good in lectures, and pronounce them a failure; but the error often arises from expecting those delivered at Mechanics' Institutes to be of a similar kind and have the same object in view as those delivered before students in colleges. It is not practicable, nor even desirable, that systematic instruction should be given at Mechanics' Institutes by means of lectures. They should rather be of a suggestive character, pointing out the several advantages to be required by devoting the attention to the study of particular departments of science and literature, and be at the same time sufficiently attractive to secure the attendance of a numerous audience. If this be kept in view, lectures may prove a very valuable aid to most Institutions, and promote not only the pecuniary resources but the efficient working of the other departments by exciting a taste for mental cultivation.

In some Institutes a plan has been very successfully adopted of canvassing the locality to take season tickets

for a specified number of lectures, and then making arrangements for the payment of lecturers according to the amount collected. It has the advantage of securing the committee against pecuniary loss, and at the same time of promoting the interests of the Institution. As to the number of lectures and rates of subscription, this is a subject which depends in a great measure upon the population, and which of course can be better judged of by each local committee. Great assistance in this department is supplied by the Yorkshire Union, who publish in their annual report a list of gentlemen willing to give gratuitous lectures, in addition to a list of paid lecturers. In the latter respect some good might be done by the Society of Arts, either through the advertising columns of their *Journal*, or by a list at stated intervals.

In my previous letters I spoke more particularly of the mode of extending the benefits of the Examinations of the Society of Arts by a systematic arrangement of Local Boards. I would now impress upon the managers of Institutes the importance of arranging by special classes for the study of the particular subjects comprised in the Society's programme, to take the initiative in inducing their members to enter into competition for the certificates, and to make the particulars known as widely as possible, so as to obtain the greatest number of candidates. If exertions be diligently used for this object, it will be found that the Examinations, by acting as an incentive to emulation, will materially promote the success of most of the Institutes that may be brought within their influence.

I am, &c.,
BARNETT BLAKE.

Leeds.

DRAINAGE BY ABSORBENT WELLS.

SIR,—The account I gave of the French absorbent wells, in 1840, and some remarks of mine on the same subject in the *Journal* of the Society, have been brought forward in support of the plan for discharging the sewage by means of such descending wells. I believe that M. Lealie will do great good by recommending absorbent wells as an occasional expedient for getting rid of impure water in the marshy and low-lying districts, but there are many objections to their application for discharging sewage matters into the sandy and gravelly strata. The experience of Paris is opposed to it, for the well at Bondy got choked with solid matter, but there is, as I consider, the stronger reason, that to discharge manure underground would be no better than to discharge it into the sea, being only another form of wastage. There can be no doubt, as Mr. Mechi observes, that the underground strata would sooner defecate in the manure, but what we want is to accomplish the great object, long advocated by him, of saving the manure. Mr. Chadwick has shown, by the experience of Paris, that this has been accomplished to a considerable extent; and I should be sorry to be considered the advocate of any expedient which, instead of preserving fertilising materials, condemns them to destruction.

I am, &c.,
HYDE CLARKE.

42, Basinghall-street, E.C., 23rd August, 1858.

Proceedings of Institutions.

LONDON MECHANICS' INSTITUTION.—A public meeting of this Institution was held on Friday last, the 20th inst. in the theatre, Southampton-buildings, W. L. Birkbeck Esq., president, in the chair. The object of the meeting was to receive the report of a special committee appointed in 1856 to collect funds to relieve the Institution of its building and floating debts. The following is a copy of the report:—"Your committee have to report to this meeting that they have, in pursuance of the power

conferred upon them, collected the sum of £68 16s., and have further donations announced amounting to the sum of £47 3s., making together £115 19s. Out of the above sum of £68 16s., they have paid a sum of £10 to the Institution for a specific purpose. They have incurred expenses in making repeated applications to the government, rendered necessary by adjournments, at the latest moment, of appointments made at the treasury and elsewhere, and other preliminary proceedings, amounting to the sum of £20 1s. 4d., leaving a present balance of cash in hands of committee of £38 14s. 8d., which will appear more in detail by the cash account annexed. After mature deliberation, your committee have come to the conclusion that it is at present almost impracticable to collect a fund for the payment of the building debt of the Institution (which appeared to be the main object sought by the members in the appointment of your committee) and that the best course to adopt under the present circumstances will be to appeal to the public for funds to meet pressing emergencies, and especially for the reduction or extinction of the rent. For the sum of \$3,500 the lease could be purchased, and thus the Institution could be relieved from the heavy annual payment for rent of £200. Your committee propose that an appeal be made to the public for donations to the amount of at least £1,500, leaving the remainder, if necessary, to be raised by mortgage of the lease purchased, by which means the annual rent would be materially reduced. Though your committee conceive that they have, under the terms of their appointment, the power to carry out this extended object, to remove any doubt that may exist upon the subject, it is now proposed to give them that power by a formal resolution. Several applications, both public and private, were made to the government for assistance, and some hopes were held out by Lord Granville, the then President of the Privy Council, to a deputation, consisting of members of this committee, officers and friends of the Institution, that material aid might, under certain conditions, be granted, and they were referred to the Treasury; but a dissolution of Parliament, hurried session, and change of ministry, occurring almost immediately afterwards, prevented that application from being prosecuted by the committee. The committee are of opinion that the terms upon which the subscriptions already announced have been received require that they should be returned to the subscribers who wish to withdraw them. The committee, however, believe that as a question of fact, all the subscribers are willing that their donations should be applied to the object which has been to-night announced. Your committee having now informed you of the steps they have taken, and of what they purpose doing, and having asked you for additional powers to enable them to carry their views into effect, place themselves in your hands. If you are content to express your confidence in them by granting them the further powers they ask, they are willing and anxious to unite with energy for the permanent resuscitation of this Institution; or, on the other hand, if you desire it, to resign their trust into your hands." The report was unanimously adopted by the meeting; and subscriptions were announced, in furtherance of the objects contemplated by the committee, amounting to £160. The committee was re-appointed, and the president expressed a strong conviction that its efforts would be ultimately successful. The following resolutions were carried unanimously:—"That the committee be empowered to collect subscriptions for the purchase of the lease of the Institution, and that the special committee report progress and donations received to each quarterly meeting." "That the auditors of the Institution be appointed auditors of the committee's account."

NEWPORT.—The new reading-room and library in connexion with the Athenæum and Mechanics' Institute, was opened on Wednesday, the 4th August. It is large and commodious, being 42 feet in length and 20½ feet in

width, and is regularly supplied with a large number of papers and periodicals. The library contains upwards of 2,700 volumes, and additions are constantly being made. Classes for instruction and mutual improvement are intended to be formed during the ensuing quarters, and various lectures on popular, scientific, and amusing subjects will be delivered.

WINDSOR AND ETON.—A fête, in connexion with the Literary, Scientific, and Mechanics' Institution, took place at St. Leonard's, on Tuesday, the 17th instant. There was a very large gathering, although not so numerous as last year. The entertainments commenced with two cricket matches, one between members of the Windsor and Eton Institution against 11 of the Maidenhead Institute, and another between the junior members and the sons of members. There was a dinner, at which about 100 members of the Institute and their friends sat down. William Vansittart, Esq., M.P., occupied the chair. The other member of parliament for the borough, G. W. Grenfell, Esq., was unfortunately prevented from being present. In the afternoon, dancing, archery, and the Albanian minstrels were the chief attractions. The band of the Coldstream Guards was in attendance. Quoits and various other games were played. In a pecuniary point of view, it appears to be doubtful whether this fête will prove itself nearly so good as that held last year, for, although her Majesty contributed ten guineas, the Prince Consort and the Duchess of Kent each five guineas, and the members for the borough a like amount, the expenses this year have been far heavier, and the receipts from the sale of tickets considerably less. The day was observed in Windsor as a general holiday, nearly every shop was closed by one o'clock, and the bells were constantly ringing merry peals.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Aug. 20, 1868.]

Dated 28th July, 1868.

- 1697. A. Kellermann, Courbevoie, département de la Seine, France—The employ of new vegetal substances for dyeing, and especially to replace cochineal dye.
- 1699. M. Johnson, Wheelock Iron Works, Sandbach, Cheshire—An improved rotary steam engine.
- 1701. J. Mantou, Birmingham—A new or improved candlestick.
- 1703. W. E. Newton, 66, Chancery-lane—Imp. in gas meters. (A com.)
- 1706. H. Harden, Dandalk—Imp. in the construction of tubular steam boilers.
- 1707. E. A. Cowper, Great George-street, Westminster—Imp. in generating power from steam, and in engines and apparatus for that purpose.
- 1709. J. Cliff, Imperial Potteries, Lambeth—Imp. in the manufacture of soap.

Dated 29th July, 1868.

- 1711. J. Musgrave, Balmet—Imp. in stalls and inclosures for horses, cows, and pigs.
- 1713. G. S. Parkinson, 10, Lambton-terrace, Kensington—An improved connecting apparatus for working railway breaks, and effecting a communication between railway guards and drivers.
- 1715. J. L. Hinks, Birmingham—Imp. in machines for cleaning knives, forks, spoons, and such other articles as are or may be cleaned by polishing, also in machines for sharpening knives.

Dated 30th July, 1868.

- 1717. J. Luis, 12, Welbeck-street, Cavendish-square—A machine for cutting up almonds for the use of confectioners and others. (A com.)
- 1719. J. Luis, 12, Welbeck-street, Cavendish-square—A new system of infusion apparatus. (A com.)
- 1721. J. Spence, Liverpool—An imp. in the manufacture of sheet, hoop, and nailrod iron.
- 1723. C. Schiele and F. Schiele, Oldham—Certain imp. in "hydro-extractors," or centrifugal drying machines, and in the method of lubricating their bearings, which method is also applicable to other bearings where lubrication is required.
- 1725. T. Webb and J. Craig, Tutbury, Derbyshire—Imp. applicable to spinning, doubling, winding, and warping yarns or threads.
- 1727. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in candlesticks or holders for candles. (A com.)

Dated 31st July, 1868.

1729. J. S. Bailey, Kelghley, Yorkshire—Imp. in machinery for combing wool and other fibrous materials.
1781. W. Hartley, Bury—Imp. in the arrangement of slide valves and side pipes, or valve casings of steam engines.
1733. G. Ashcroft and H. Wood, Blackweir, Cardiff—An imp. in hydraulic machinery.
1735. J. Houston, Nelson-square, Blackfriars-road—Imp. in the means of effecting the consumption of smoke in furnaces.
1737. H. Coneybear, Abington-street—Imp. in apparatuses for generating and super-heating steam and for producing the condensation of steam.
1739. E. J. M. Cetti, Brook-street—An imp. in barometers, gauges, and other analogous instruments.

Dated 2nd August, 1868.

1741. E. Agnani, 29, Devonshire-street, Queen-square, Bloomsbury—Increasing particularly the effect of decorative pictures, landscapes, drawings, and prints.
1742. G. S. Hill, Ryde—Imp. in hydro-pneumatic machinery.
1745. R. E. Jackson, Blackburn—Certain imp. in machinery or apparatus for sizing yarn.
1747. S. Hine, Macdonald—Certain imp. in machinery or apparatus for twisting, doubling, and retwisting and winding silk or other similar fibrous material.
1749. W. B. B. Harvey, Bagnal-villa, Gresham-road, Brixton—Imp. in dry or saw processes.
1751. E. Heywood, Liverpool, and W. Heywood, Manchester—Imp. in the construction of metallic pistons.
1753. M. Billing, High Holborn—Imp. in metallic bedsteads and cots.

Dated 3rd August, 1868.

1755. G. Davies, 1, Serle-street, Lincoln's inn—A process and apparatus for the extraction of oils for illuminating and lubricating purposes, and of carburetted hydrogen gas, from the native bitumen of the West Indies. (A com.)
1757. J. Shaw, Manchester—A machine for the manufacture of pasteboard and cardboard.
1759. J. Steel, Glasgow—Imp. in brewing and distilling.
1761. Lieut. J. Kingsley, 52, Great Cornam-street—Imp. in the construction of steam boilers.
1762. J. Greenwood, Rawden, near Leeds—Imp. in the construction of steam boilers and other apparatus for heating water or superheating steam, which improvements are also applicable when heating air.
1765. C. De Jongh, Lautenbach, near Guebwiller, France—Imp. in machinery for assorting and preparing for spinning silk and other fibrous substances.

Dated 4th August, 1868.

1766. C. Callebaut, 2, Rue Ste. Appoline, Paris—Imp. in sewing machines.
1767. J. Speece, Liverpool—An improved method of rolling sheets from puddled steel or steel iron.
1768. J. Taylor, Birkenhead—Pneumatic and hydraulic machines.
1769. J. J. Russell, Wednesbury—Imp. in machinery for cutting and screwing the ends of tubes.
1770. J. W. Giles, Sydney, New South Wales—An imp. in propelling vessels.
1771. J. Badcock, High-street, Highgate—Imp. in apparatus to be applied to ladies' dresses and other articles of wearing apparel.
1772. W. Clay, Liverpool—An improved manufacture of metallic hoops, bands, and other analogous articles.

Dated 5th August, 1868.

1776. L. Hall, Black-lane Mill, near Bury, Lancashire—Certain imp. in looms for weaving.
1777. J. Luis, 18, Welbeck-street, Cavendish-square—A machine for pulverising shell, horn, and whalebone. (A com.)
1779. J. Luis, 18, Welbeck-street, Cavendish-square—A machine for drilling and grooving the naves of wheels, and also for forcing the axle box into the naves. (A com.)
1781. E. Leigh, Manchester—Imp. in machinery or apparatus for preparing and spinning flax, wool, silk waste, or other fibrous materials.
1782. D. McCrummen, Gourcock—Imp. in the manufacture or production of paper, which improvements are also applicable in the production of alkaline and other salts.
1785. R. A. Brooman, 166, Fleet-street—Imp. in knitting frames. (A com.)
1787. W. Clay, Liverpool—Imp. in the construction of certain descriptions of bridges and girders.
1789. W. E. Newton, 68, Chancery-lane—An improved mode of ornamenting textile fabrics. (A com.)

Dated 6th August, 1868.

1791. G. H. Bovill, Durnsford-lodge, Wimbledon—Imp. in the manufacture of gas, also in the manufacture of coke and other fuel.
1793. C. F. Kirkman, Argyle-street, Regent-street—An improved mode of treating sewage of agricultural uses, and for machinery to be employed therein.

Dated 7th August, 1868.

1795. G. Watson, 6, Pond-hill, Sheffield—A washing machine.
1797. J. Walker, City-road—Imp. in the manufacture of electric telegraph cables.
1799. J. Smith, jun., Coven, near Wolverhampton—Imp. in agricultural steam engines, and locomotive steam engines to be used on common roads.
1801. J. Luis, 18, Welbeck-street, Cavendish-square—A new evening, doubling, and twisting machine. (A com.)
1803. J. Taylor, Roupell-park, Streatham-hill, Surrey—Imp. in the manufacture of blocks for the construction of sewers and drains.
1805. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in apparatus for working railway breaks. (A com.)

Dated 9th August, 1868.

1807. J. G. Pickling and T. P. Purnaglove, Battersea—An improved pressure gauge for steam, gas, or other fluids.
1809. T. Ingram, Bradford—Imp. in means or apparatus for operating railway breaks.
1811. W. Smith, 3, Montrose-villas, Pownall-road, Dalston—An improved compound for coating or insulating electric telegraph wires, and for coating other surfaces.
1813. A. H. Williams, Cornhill—Imp. in fastenings for portfolios, pocket-books, and other like articles.
1815. W. E. Newton, 68, Chancery-lane—Imp. in machinery for drawing and twisting wool, or other fibrous material. (A com.)

Dated 10th August, 1868.

1817. T. Pickford, Mark-lane—Imp. in the preparation and manufacture of manure.
1819. M. Henry, 64, Fleet-street—Imp. in the manufacture or production of salt-petre, and the preparation of materials for the purpose. (A com.)
1821. F. Haack, Schaebeck, near Brussels—Imp. in the construction of coaks, taps, or valves.
1823. J. H. Whitehead, Royal George Mills, Saddleworth, Yorkshire—Imp. in the manufacture of woollen bags.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1826. M. A. F. Mennesson, 39, Rue de l'Ecliquier, Paris—Imp. in the construction of Jacquard looms. (A com.)—14th August, 1858.

WEEKLY LIST OF PATENTS SEALED.

August 20th.		August 26th.	
360. E. Borlase.	477. G. F. Harrington.	477. G. F. Harrington.	
365. J. Petrie.	488. E. Roberts.	488. E. Roberts.	
371. E. F. Miller.	492. G. T. Bousfield.	492. G. T. Bousfield.	
374. J. Arnold.	498. M. Smith.	498. M. Smith.	
375. J. B. Barnes and J. Leach.	501. T. T. Chillingworth.	501. T. T. Chillingworth.	
376. J. Templeman.	513. S. Walker.	513. S. Walker.	
378. S. Middleton.	1181. G. Chendle.	1181. G. Chendle.	
382. J. Morrison, senr., and J. Morrison, junr.	1268. J. F. Dickson.	1268. J. F. Dickson.	
388. J. Knott.	1312. G. Castle.	1312. G. Castle.	
446. J. H. Johnson.	1316. T. Chatwin and C. Taylor.	1316. T. Chatwin and C. Taylor.	
458. J. W. Clare.	1339. G. T. Bousfield.	1339. G. T. Bousfield.	
461. J. H. Johnson.	1357. J. Rubery and T. Warwick.	1357. J. Rubery and T. Warwick.	
	1359. G. T. Bousfield.	1359. G. T. Bousfield.	

PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID.

August 16th.		August 18th.	
1822. F. Journeux.	3021. G. Lowry.	1915. W. Wood.	August 21st.
		1909. J. G. Martien.	August 21st.
		1912. W. Kidman.	August 21st.
		2013. J. G. Martien.	August 21st.
		2023. J. G. Martien.	August 21st.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	Title.	Proprietor's Name.	Address.
In some , August 25.	{ Fastening for Porte Monnales, Pocket } { Books, and other Cases..... }	C. Weintraud, jun.....	Offenbach on the Main.
adopted of c , 26.	A close or open fire Kitchen Range	W. Broughton.....	7, South-street, Finsbury.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 3, 1858.

NOTICE TO INSTITUTIONS.

The Prizes and Certificates awarded at the Examinations held in May last, have been forwarded to the several Local Boards for distribution.

Copies of the Programme of Examinations for 1859 may be obtained on application to the Secretary of the Society of Arts.

EAST LANCASHIRE UNION OF INSTITUTIONS.

The First Report of this Union, which owes its origin to the exertions of Sir James Kay Shuttleworth, Bart., has been recently published, and as the particulars of the examination and prize scheme associated with it have already appeared in the *Journal*,* it has been thought that an outline of its proceedings will be found useful to Associations of a similar character already established, as well as suggestive to all who are interested in the progress of Institutions in various parts of the country. Local Unions of this character must always form most valuable aids to the Society of Arts, in stimulating the energies and improving the character of Mechanics' and similar Institutions, principally because their tendency has always been to give to these Institutions a really educational bearing; and ultimately it may be hoped that each Local Board of Examiners will form the centre of a "Union" of this nature.

The report commences with a short description of the district in which this Union has been established.

"The cotton manufacture has penetrated along the course of the streams which feed the Irwell and the Ribble, into valleys surrounded by moorlands, rising to one or two thousand feet above the sea, and known as the forests of Rosendale and Pendle. The streams, which caused the selection of the sites of the original manufactories, mark the lines of most easy ascent through the valleys, and determine therefore the sites not only of mills and hamlets, but the course of roads and railways.

"Since East Lancashire has been found to be rich in coal, a great impulse has been given to its trade and population. In every valley well-built villages seem strung together along the road or railroad, between which intervene hamlets, mills surrounded by groups of cottages, villas, churches, and farm-houses. This scene of enterprise and wealth extends, with little interruption, long the Irwell from Bury to the summits of Haslingden and Rosendale moors, and then descends on the other side of the watershed, through several valleys to Blackburn, Whalley, and Pendle.

"The growth of the towns, villages, and hamlets of East Lancashire has been so rapid and recent that their villification is in its earliest stage of energetic growth. Since 1846 considerable progress has been made in the number of elementary day-schools, and in their efficiency; even in the more considerable villages these schools are taught by certificated masters and pupil teachers.

"Not only in the towns of Blackburn, Burnley, and Leighton, but in many of the manufacturing villages of East Lancashire, evening-schools of various degrees of efficiency have followed in the wake of elementary education. These evening-schools have generally the title 'Mechanics' or Literary Institutions. In almost every

case a library and news-room are connected with them. They have only occasional lectures. The evening classes, before the East Lancashire Union was formed, were taught either by the master of some elementary day-school, by voluntary teachers like those which have conducted Sunday-schools, or by paid local teachers, employed as clerks or mechanics, &c., in the day time. One of these agencies often existed alone; sometimes they were combined. In two or three Institutions they all existed together.

"In some the voluntary services of professional gentlemen and of day-school teachers have been exemplary, and the prosperity, if not the existence, of certain of these Institutions, has been mainly attributable to this self-sacrificing aid. The funds of almost all the Institutions have been very slender. They were chiefly derived from the weekly or quarterly payments of the working men attending the classes, and from the profits derived from annual meetings, tea-drinkings, and to a slender degree only from local subscriptions from the middle classes. The payments of the members for the use of the library and news-room, and for admission to the evening classes, vary from 1s. 6d. to 2s. and 2s. 6d. per quarter; and from 3d. to 2d. per week, or to 1s. 6d. per quarter for the evening classes only.

"In the village Institutions, from 20 to 70 pupils assemble on two or three nights in each week. In Burnley, the number on the books of the two Institutions is 246, and the average attendance on the classes 182. In Haslingden 115 are on the books, with an average attendance of 45.

"The great majority of the members are employed in the cotton factories, those earning their livelihood by handicraft trades not amounting to one-sixth of the factory workers. Scarcely any are employed in agriculture, and but few in shops or counting-houses. The very great majority are between the ages of 15 and 30.

"The staple subjects of instruction are reading, writing, and arithmetic, English grammar, composition, and geography, and the pupils give in nothing stronger proof of their native shrewdness than in the perseverance which they display in their preference of the classes in which these subjects are taught to merely amusing lectures, and to other studies not requiring close drudgery to master the elements. They well know that to write a good hand, to be able to spell correctly, and compose a letter of business accurately, and to be a fair accountant, are qualifications indispensable to any office of trust. These, therefore, are the objects, to accomplish which, the East Lancashire workman plods regularly twice or thrice a-week to his evening school. But it is on this basis that higher attainments also can be built, and that a wider view of the knowledge which can improve the labourer can be gained, and not a few receive a permanent impulse towards intellectual pursuits, and acquire purer tastes and a higher conception of the objects and duties of life.

"The East Lancashire Union originated in a general sympathy with these exertions of men supported by manual labour, and of their employers and friends, to supply the want of early school training, or to remedy its deficiencies. It was known that the attendance on the evening classes fluctuated,—being in some years double or treble that of others. Generally in the summer the number of members did not exceed one-half or two-thirds that of the winter. In the autumn the classes often dispersed. Some village Institutions had a feeble life, with a meagre apparatus of instruction, few members, and intervals in which their proceedings were entirely suspended.

"To strengthen the managing committees by that encouragement which arises from co-operation, it was thought desirable that the Institutions of East Lancashire should be organized into one Union, in which each should be represented in a council. The fluctua-

* See present Vol., p. 329.

tions of attendance, and the want of perseverance in a course of self-culture, pursued from year to year, might, it was hoped, be diminished by a system of examination and prizes, which would not only reward by an immediate distinction the exertions of the candidates, but encourage them by the hope that the employers of labour throughout the district would recognise the value of such pursuits, by selecting for employment and promotion not only the successful candidates for prizes, but the most zealous and persevering members of the evening classes.

"The scheme of examination was so framed as to give prominence to those rudimentary English exercises which are the instruments by which other knowledge is gained, and then to lead the humble student to acquirements which would expand his intelligence, rather than to a narrow and eager devotion to a single subject. The object sought was a sound knowledge of the elements of an English education, solid in each part, but not restricted to one separate technicality. On this firm basis those gifted with greater power, or favoured by more ample leisure, were encouraged to build a somewhat larger structure of learning appropriate to their station in life. By this means, it was hoped, that the subjects taught in each institution would be gradually matured in proportion as its resources in teachers, books, and apparatus grew.

"To increase the strength of these agencies a fund was collected, toward which liberal annual contributions were made by the principal landed proprietors of East Lancashire, and by some of the chief manufacturers. This fund provided, in the first place, for the working of the examination and prize scheme.

"A persevering effort was then made to introduce into the Union a higher class of masters, who should visit each institution on appointed evenings, to organise and teach the classes; to give brief collective lessons on such subjects as physical geography and history, &c., and to deliver courses of Saturday evening lectures.

"A weekly visit of the organising master, besides the immediate benefit to be derived from his systematic and skilful instruction, was intended to prove a stimulus to the exertions of the teachers and visitors. It was expected that he would increase the interest of the working men in the evening school; that he would promote the better furnishing of the class-rooms, and organization of the classes; the purchase of books, maps, and apparatus, and the growth of a stronger local interest in the well-being of each institution.

"The organising masters selected had passed through the entire career of education from apprenticeship as pupil teachers; had gained Queen's Scholarships, and obtained three years' education in a training college, followed by the subsequent experience of two years as teachers of physical science in their college.

"The masters so qualified were allowed salaries of £100 per annum, and their travelling expenses on a moderate scale, in addition to the augmentation paid to them by the Committee of Council on Education. They were expected to teach on five evenings in each week, for two or three hours, the classes of separate Institutions, and each Saturday evening to deliver one of a course of four lectures. This course was to be devoted to some subject of immediate sanitary or commercial importance, and was to be delivered successively at each Institution throughout the Union. The organising masters were allowed four hours daily to derive remuneration from other professional pursuits, consistent with their engagements in the Union and their obligations to the Committee of Council.

"Each Institution which has the advantage of the instruction of the organising master in teaching its classes on one evening weekly, pays to the funds of the Union £15, and for two evenings weekly, £30.*

"Several of the Institutions thus visited by the organising master have a fresh supply of books; some have improved their class furniture; almost all have increased the number of their members and of their candidates for prizes, and in all the greater efficiency of the instruction has increased the local interest in the Institution. The Saturday evening lectures have been steadily attended; they have been illustrated by appropriate experiments, and by diagrams and apparatus which have been purchased for this purpose.

"The Education Department of the Privy Council has also admitted the Council of the Union to participate in the same class of advantages from their grants as the committees of day schools are allowed to claim for their evening schools. This rule enables the Council to procure for each Institution the aid of an assistant or local teacher, towards whose stipend the Committee of Council pay £10.

"This local teacher is commonly some artisan or clerk who has been educated in the Sunday, day, and evening schools, and by persevering self-culture has acquired a competent knowledge of the subjects of elementary instruction. The conditions of his appointment are, that he pass an examination before H.M. Inspector of Schools; that a sum equal to that paid by the Committee of Council on Education be derived from the school fees paid by the members to the funds of the evening school, and that the evening class be found in a satisfactory condition on inspection.

"The efforts of the local teachers for self-improvement may be greatly aided by the organising masters. They may guide the reading of the local teachers,—initiate them into improved methods of instruction, both by example and private suggestion, and thus prepare them to avail themselves of the minute of the Committee of Council, by which, after one year's service, they may gain a Queen's Scholarship and enter a training college, or after three years' service, may present themselves for examination for a certificate of merit. The local teachers hold the same relations in these respects to the organising masters as assistant teachers to the masters of day-schools.

"It would also always be well that in every Institution in the Union one or more candidates for the office of local teacher should be in training under the superintendence of the organising master, so as to be ready for examination when any vacancy occurs.

"The examination and prize scheme for 1854-7 proved throughout the Union a useful stimulus to the members of the evening classes. Their attendance became more regular, their members increased, and their zeal in their studies was more marked and constant. The Committee of each Institution also showed a growing interest in the success of their candidates, and in the development of the means likely to promote this result.

"This stimulus has also in some Institutions extended to the valuable exertions of the gratuitous teachers. These important services have been rendered with great zeal and self-denial in several of the Institutions. Some of the most important evening schools in Manchester are mainly dependent on the voluntary agency of the same kind that supports Sunday-schools. In others, skilful teachers, and professional men, clergymen, and others devote themselves to this work. Too much praise can scarcely be given for the admirable examples of self-labours which exist in the Union."

The report then goes on to say that in August, 1857, twenty candidates were examined, some of whom were successful in obtaining prizes.

"The examination and prize scheme for 1858 was founded on the experience thus acquired. Besides many modifications in detail, it called the attention of the Committees of Institutions throughout the Union to the organization of female classes. Subsequently a circular was issued by the Council, to diffuse among the local committees a knowledge of the expedients which had

* For instructions to Organising Masters, see page 617.

sen most successful in the founding and working of small classes."

"During the winter of 1857-8 exertions were made to found a School of Art in Burnley, in connection with which it was hoped that branch schools might be formed in other parts of the Union. In Burnley the School of Art opened in April with 730 pupils in elementary day-schools; a class of 90 teachers and pupil teachers; a class in each of the two Institutions for artisans, attended by 34 together; a class of 17 in the Grammar-school, and a ladies' class of 20 members. A supply of models and apparatus was obtained, at reduced prices, from the Department of Science and Art. The department also selected from among its certificated students, Mr. Gunn to take charge of the drawing classes, under the direction of a local Art Committee. When these steps had been taken, the School of Art was recognised by the Council of the East Lancashire Union as a part of its organisation, and the committees of certain neighbouring Institutions were invited to consider the arrangements necessary for the formation of other local schools. The negotiations for this purpose are still in progress. Whenever a class can be formed for ladies or gentlemen, of twenty or thirty members, the art master will be enabled to undertake, for the same low rate of remuneration as at Burnley, the instruction of classes of artisans, and teachers and pupil teachers. Artisans who are members of Institutions pay 1s. 6d. per quarter; those who are not members, 2s. 6d.; and tradesmen, 2s. per month, with 2s. entrance fee. Teachers pay 10s. per annum, and pupil teachers 2s. 6d.

"The ladies' and gentlemen's class, according to the distance travelled by the master, pays from 20s. to 40s. for one hour weekly, and from 30s. to 60s. for two hours weekly.

"Thus far is recorded the experience of the Council in their efforts to promote the prosperity of the Institutions of the East Lancashire Union by a common organisation. If this Report should encourage the formation of similar Unions in other districts, perhaps advantage would be derived from a statement of some conclusions derived from this experience.

"The East Lancashire Union is comprised in a circle, the longest radius of which does not exceed ten miles; and from Burnley and Accrington railways branch in three directions. They penetrate also the valleys of Rossendale. The organising masters, therefore, visit the evening schools to teach and lecture at small expense of time and money.

"Even with these facilities of intercourse, the Council are of opinion that the Union could not be extended beyond this circle, without losing that compact corporate character which seems essential for its success. Some of the members of the several committees are known to each other. The state of each town and hamlet is understood. The occupations of the members of the evening classes and of their directors in each institution resemble those of others. There is that bond of neighbourhood which produces a compact structure capable of harmonious action. This corporate life would become languid, or wanting in harmony, if the Union were more extensive.

"The importance of the Institutions by which the education of the workman is carried forward from the ordinary school-age to manhood, and the need of some organisation to give them a more energetic life, is daily becoming more apparent. The Government and the religious communities now expend annually on day and Sunday-schools, including the school-pence paid by the scholars and the cost of the evening-schools, a sum certainly not much less than two millions. In the cotton

districts the schooling of a child ceases at thirteen, and he keeps half-time at work and school from eight to thirteen. In the agricultural districts he leaves school at ten, or eleven, or earlier. Even in schools conducted by certificated teachers, aided by pupil teachers, with every appliance of instruction, the schooling thus obtained cannot be expected generally to form habits of self-culture, such as would induce or enable the child taxed with daily labour, when the day-school is left, unaided by the evening-school, and tempted by rude, if not coarse forms of recreation, to improve the little learning he had gained. Too often this slender stock dwindles year by year with neglect, until even his poor skill in reading, writing, and counting becomes more and more imperfect. Then come the temptations of youth, and at the time when mind and the senses strive for mastery, unless the young man finds which is the nobler part of his nature by its cultivation, he is bewildered by passion and degraded into sensuality. In this strife the little learned at school is lost, and the man at twenty probably cannot sign his name to the register of his marriage. Should such a result be general, the nation is expending two millions annually to purchase what is too meagre and transient. If attendance on the day-school ceases at ten and thirteen, and its influence be lost in the turbulent effervescence of youth, such a fact once established, and nothing done to remedy the evil, the promoters of elementary schools would lose at least the earnestness of their faith in the regenerating influences of education on the character and destiny of the humbler classes. Neither the zeal of the religious communities, nor the political foresight of the Government could be appealed to for so large an annual outlay, unless each successive generation brought up at school became less sensual and more intelligent.

"The waste of costly effort occurs not in the school, but in the time between the school-age and manhood. Habits of self-culture can alone prevent this waste, by improving what it has cost two millions of annual outlay to create. These habits, according to our experience, are seldom formed without aid. That assistance may perhaps be effectually rendered if evening-schools be universally founded, and so efficiently conducted as, with every proper incentive, to attract to them the youthful population between the school-age and manhood. In this view the evening-school becomes an institution as indispensable as the day-school to those influences of education on the character of the population, for the hope of which we now pay so large a sum without attaining the result which we seek. Every expedient, therefore, which can promote the increase and ensure the efficiency of evening-schools, must be important as part of the machinery of national education.

"To attract the working men to these schools, no local expedient would be so efficient as that the employers of labour should invariably inquire of every candidate for employment as to the whole course of his education. If parents and our youth knew that the master always ascertained and recorded how many years had been spent at the day and Sunday-school—how long and with what degree of regularity the evening-school had been frequented—whether a prize or certificate had been obtained—whether the youth had been employed as a Sunday-school teacher, or local teacher of an evening-school—then they would know that early education and subsequent self-culture were sources of confidence and respect leading to offices of trust.

"A sense of the value of education on this lower ground must probably precede the higher conviction of its importance as a means of self-discipline. This is a better state of mind which seeks to perform the duties of the sphere in which we are born, perfectly in the sight of God and man, with calm contentment in our lot, than that which only strives to rise in life without reflecting on the more weighty responsibilities of that higher condition. This better state of thought will in time visit

many minds who, in the fervid time of life, first strive to rise above the condition of manual labour. Those who seek to better their material condition may attain a vastly greater gain, though they remain dependent on daily labour. It is therefore pleasant to record, that at the formation of the Union a majority of the principal manufacturing firms signed a declaration* that they would attach great value to the certificates awarded by the Council. The Council also have learned, with much satisfaction, that the prizes and certificates gained at their first examination have, in some instances, been followed by promotion to offices of trust, and in many have been otherwise advantageous to the successful candidate."

The Report then proceeds to draw attention to the great public advantage that would arise if the primary nominations to the whole of the smaller offices of the Excise, Customs, Inland Revenue, and Post-office, were limited to those who distinguished themselves at Examinations of this character. It appears that the number of the subordinate offices for which the scholars of elementary day-schools might, if they retained habits of self-culture through youth to manhood, fit themselves at ages varying from 17 to 23, has been carefully ascertained by Mr. Horace Mann, the Assistant Secretary to the Civil Service Commission. There are 12,618 offices worth £50 to £80 per annum in the Excise, Customs, and Post-office, affording from 700 to 800 annual vacancies. Also 3,840 clerkships exist in the Customs, Inland Revenue, and Post-office, with about 300 vacancies annually, and a further prospect of promotion to offices of from £300 to £600 per annum.

"The preceding considerations apply equally to the great mass of the working population of Great Britain, and with peculiar force to those portions of it which, like the inhabitants of East Lancashire, are distinguished by a hardihood and skill in all forms of manual labour,—by an energy and enterprise which so frequently raises the workman to the rank of employer, and by an intelligence which has enriched with subtle inventions those combinations of the physical powers by which the Cotton Trade has triumphed over all competition. Amongst this noble race of men, there are also rarely-gifted minds, who, untrained even by the humblest elementary schooling, have battled manfully with their fate, and step by step emerged from the slough of ignorance and brutishness. They have learned to read on scraps of newspapers and pamphlets from whomsoever they could snatch a moment's sympathy and help. They have learned to write by painful efforts at imitation, whenever they could get anything to copy; in like manner to cypher. They have found some elementary work on mechanics, mathematics, or chemistry at a book-stall, and mastered everything in it. Without a teacher, without a guide,—led by those events which we call accidents, to the pursuit natural to their genius, such men have sometimes become the architects of the fortunes of our chief families. There are such men living and amongst us now, and from their own lips we learn how eagerly they would have embraced opportunities of self-culture like those offered in the Evening Classes of the East Lancashire Union; and how many victims, not so aided, have not had physical strength to endure the arduous struggle of daily toil and midnight sweat of the brain, but have perished unrewarded and unknown.

"There is another class of self-educated working-men, of a gentler and more retiring character, and less vigorous enterprise;—the self-educated students of nature; the self-taught botanists, entomologists, and geologists, who, working at a handicraft which leaves them some hard-earned leisure, devote it with a calm but enduring enthusiasm to read that page of the Will of God which is open to every inquirer. Mr. Binney, of Manchester, has watched

with deep interest the lives of many such men. Their biographies have been briefly recorded from time to time in the county papers by faithful and sympathising friends. Some of them are personally known to members of this Council, who can testify, from intimate association with them, how much such pursuits refine, elevate, and purify. Even a scholar-like demeanour distinguishes some of the class of humble naturalists, who have a store of information from sedulous reading out of their peculiar map. Their calm pursuits make them content with their lot.

"The East Lancashire Union will not fulfil the intentions of its promoters unless it offer facilities for such opportunities of meeting, and other forms of encouragement to the self-taught naturalists of the district. Its present classes afford means of mastering the elements of all, and men of genius will, with the aid of organising masters, libraries, apparatus, and lecturers, be enabled, with abundant sympathy, to tread the upward path of science and literature.

"Such opportunities for men of humble station and great ability were formerly afforded by the bursaries and exhibitions of our endowed schools, which launched them on a career of university education. The Queen's Scholarships, which open a path to the Training College for the local teachers of evening-schools, partake of the character of these ancient endowments in their intent to reward such intellectual merit by means of further instruction.

"The Union is likely to develop among all actively engaged in working out its design a lively interest in the progressive education of the youth of the district from 13 to 30, and in the destiny of every earnest and gifted man who avails himself of the opportunities which it offers, and earns the distinctions by which his merit may be made conspicuous.

"The Council turn from the aid which the Union gives to such rare and gifted men to the opposite extreme. They may be asked what hope they have that the evening-schools can change the habits of the most squalid and ignorant portions of the population, who at present scarcely enter their classes. They point, in reply, to some indications of the gradual progress of civilisation, resulting perhaps from a general improvement in the manners of all classes—from the influence of Sunday-schools in the early part of this century; and from the use of the press, and of public opinion. The day-schools of too recent origin to have produced much effect.

"The still prevalent gambling and pigeon-flying have taken the place of even the more cruel and coarse sports, bear and bull-baiting, and dog and cock-fighting, which within a generation were sanctioned by the patronage and presence of the gentry. Let us hope that the cultivation of cottage gardens, the cricket club, and the manly game of football,—the public swimming bath and gymnastic exercises,—the chess club, the newsroom, the library, the evening classes and the lectures of the Institution, will take the place of the coarse and absurd pastimes of the lowest part of the population. The instrumental bands, choral societies, and glee clubs which exist are not abused by intemperance, but form a recreation deserving encouragement. Of late years the cheap railway excursions to the coast, or to remarkable inland scenes,—the taste for public meetings, assemblages for charitable or other social objects, and for discussions on political and religious questions, more and more engage the attention of the mass. During the recent war the papers have been eagerly read to groups of attentive listeners in workmen's houses. The civilisation thus spreading has been found to be attended with an increasing aversion from all forms of popular error on social questions, with greater security for property, and a firmer confidence in the Institutions of the country. It is the earnest wish and conviction of the Council, that it may co-operate with our common faith in creating a people contented, loyal, and religious."

* This declaration is of a similar character to that issued by the Society of Arts. See Journal, Vol. IV., p. 587.

The following circular, as to the duties of organising masters and local teachers, and the conditions on which each Institution in the Union may obtain this aid, was issued to the Institutions:—

"Burnley, November 18th, 1857.

"Sir,—At the request of the Council of the East Lancashire Union of Mechanics' and other Institutions, I convey to your Committee of Managers information of the arrangements which they will have to make in order to avail themselves of the assistance placed by the Committee of Council on Education at the disposal of the Council of the Union.

"This assistance is in two forms, viz., first, local teachers; secondly, organising masters.

"The local teacher is intended to be selected from the class of young men employed in some other vocation during the day, who are competent at least to teach reading, writing, arithmetic, and English grammar, or geography, or English history. A certificate of character and of their aptitude to teach must be sent to the Council of the Union. If nominated by the Council, they will be examined as soon as convenient by Her Majesty's Inspector in the foregoing subjects; but he will report specially in favour of such of them as have any knowledge of land or mine surveying, of mechanics, of the steam-engine, of map and plan drawing, or of chemistry. Such a special report would greatly facilitate the future promotion of the local teachers to Queen's scholarships or certificates of merit, though not required for their present appointment. Local teachers must be at least 20 years of age, and under 40, at the time of their appointment. When the evening-school consists of males and females in the same room, the local teacher must be a married man; where it is attended by females only, a female; and where by males only, a male.

"Where there are separate male and female classes, it is probable that the Committee of Council might be induced (by a favourable report from Her Majesty's Inspector, as to the qualifications of the candidates for the office of local teacher, and as to the numbers attending the classes, and their state of efficiency) to sanction the appointment of both a male and female local teacher in one Institution. Any local teacher thus nominated to an evening-school by the Council of the Union, and sanctioned by Her Majesty's Inspector, having served therein to the satisfaction of the Committee of Council on Education, upon the report of Her Majesty's Inspector, for one year, may attend the examination (Minute 20th August, 1853, c. 13) for registration, and on passing it, will be allowed a Queen's scholarship of £20 or £25 to any training school under inspection (with the consent of its managers) he may select; the amount of the scholarship to depend on his passing to the extent required under the minute of 2nd April, 1853 (Capitation), or to the extent required for pupil-teachers.

"Any local teacher nominated and approved as above to an evening-school in the Union, after three years' service under inspection to the satisfaction of the Committee of Council on Education, and being upwards of 30 years of age, may be examined for a certificate of merit; such certificate not bearing any pecuniary value until the holder be in charge of an elementary day-school fulfilling the usual conditions required for the augmentation of the salary of the teacher by Government.

"The appointment of local teacher thus opens a path in which any person in the Union now, too old to become a pupil-teacher, may gain a Queen's scholarship, may have the advantage of education in a training-school, and may enter on the career of the teacher of an elementary day-school, with a certificate of merit and augmentation of his salary by the Government. His prospects of promotion will be greatly increased if the managers can secure a visit from Her Majesty's Inspector, and if he find the evening classes in an efficient state and the attainments of the local teacher satisfactory. Though the evening classes will be liable to such inspection, it is to be noted that the very numerous engagements of the Inspectors prevent their visits unless urgent solicitations be made.

"Such advantages will, it is hoped, greatly facilitate the selection of thoroughly-qualified teachers by the managers of several Institutions and evening classes in Union.

"The Committee of Council will pay £10 annually to each local teacher so nominated and approved, who shall teach on 60 nights at least in the year, and give satisfaction to the managers as to character, conduct, and attention to duty. The local teacher will, however, probably be required by your Committee of Managers to teach on two nights in each week during about 60 or forty-five weeks, or nine or ten months in the year. The Committee of Council also require that the sum received in

fees at the evening school during the year shall equal or exceed the £10 granted by them.

"One such local teacher may be selected by the Committee of Managers of each local Institution in the East Lancashire Union for nomination and approval; and if there be well attended female classes, an application will likewise, if desired, be made by the Council for the sanction of a female local teacher, if an efficient one be selected for their approval. It is desirable that these selections should be made in the first week of December, 1857, and notified to Mr. Sutherland, in order that arrangements may be made with Her Majesty's Inspector for a collective examination of both male and female candidates before Christmas next. The examination will be in no respect difficult, but will be strictly such as is necessary to ascertain that the persons selected have a fair knowledge of the elementary subjects before enumerated, and aptitude to teach them.

"The Council of the Union are also authorised by the Committee of Council on Education to appoint masters holding certificates of merit as organising masters in the Union.

"The duties of these masters will be as follows:—

"1. They will visit and teach the evening-classes the ordinary subjects of instruction in any Institution ready to pay at the rate of £15 for one night of such instruction weekly, during the usual time the classes are open in the year.

"4. They will be specially charged to act under the direction of the local managers, in organising the evening classes for collective teaching; and on nights not appropriated to evening classes paying £15 per annum, they will visit occasionally such other Institutions as may desire their help to organise the classes, aid the teachers, and give them examples of efficient class-teaching.

"3. On Saturday evening they will visit in succession the several Institutions in the Union, and will give class lectures, illustrated by apparatus and experiments, chiefly in explanation of natural phenomena. For example, four class lessons might be given throughout the Union on (A) the mechanical, (B) the chemical constitution of the atmosphere; (C) the mode in which it may become poisonous by chemical degeneration; (D) by miasmata, and the means of preventing both forms of evil.

"4. The organising masters will be employed as assistant-secretaries to Mr. Sutherland, and will regularly attend at an office and hours to be appointed.

"5. The Council reserve for consideration the propriety of opening, in Burnley and Accrington, classes during two or three hours in the day-time, for the instruction of assistants in shops, clerks, and apprentices, in the elements of mechanical, chemical, and other scientific knowledge, in surveying or in drawing.

"Each Committee of Managers will do well to bear in mind that the appointment of a local teacher, towards whose remuneration the Committee of Council will pay £10 annually, ought to lead to their availing themselves at once of the aid of the organising master for at least one night weekly. They will also doubtless feel that the weekly visit of the organising master will be most important, not only to the efficiency of the evening classes, but to the success of their local teacher in his new career, and also to that of the candidates for certificates and prizes in their Institution.

"I have to request that a copy of this circular may be put into the hands of every member of the Committee of Managers without delay, and that a special meeting may be at once called for its consideration. "I am, &c.,

"J. P. KAY-SHUTTLEWORTH.

"To the Secretary of the Committee of Managers of the Evening Classes or Mechanics' Institution at _____."

The following are the instructions to organising masters referred to at page 614.

"The East Lancashire Union of Institutions has been formed to foster the self-education of the youth of the labouring classes in this district, between the elementary school age and full maturity.

"It is essential to the proper discharge of your duties as organising masters, that you should have a sincere sympathy with such efforts as are made by thoughtful labouring men for this end.

"You can shew this sympathy in various ways.

"Your primary and most engrossing duty will be personally to teach the elementary classes of certain Institutions the rudiments of reading, writing, arithmetic, writing from dictation and from memory, English grammar, geography, and English history.

"Even the teaching of the humblest of these elements will require much of your attention. These labours will be greatly

lightened by organising the pupils of each Institution into classes, according to their acquirements, and by introducing as rapidly as possible the collective method of oral instruction, instead of the mode of individual teaching now, in many cases, in vogue.

"You will put yourself in personal communication with the gentleman of the local committee appointed for that purpose. You will be introduced by him to the teachers who have at present charge of the classes.

"You can then, with his consent, and their aid, ascertain the amount of knowledge possessed by each pupil, and then, with the like concurrence, proceed to arrange them in such groups as will facilitate collective instruction.

"You can explain to the Committee and the teachers the arrangement which you conceive will promote the most rapid success, by the division of the pupils into classes; by the use of one lesson book in each class; by setting apart a fixed period for each subject of instruction; by drawing up, in accordance with this, a written scheme of the routine of the classes; by settling with them what classes you are personally to teach, and whether, and if so at what period, you are to examine the other classes.

"The selection from the list of the Committee of Council on Education of proper lesson books will be indispensable, if the class has not sufficient for collective instruction. A grant may be obtained in aid of local subscriptions for this object.

"Such arrangements, if made with skill, constitute that organisation without which no permanent success can be hoped for in any school.

"These duties will occupy three-fourths of your time on the evenings in which you visit Institutions for elementary instruction.

"The remaining fourth part of the time each evening may, with the concurrence of the local directors, be devoted to a lesson to be delivered by you to all the members of the evening classes of the Institution. For this lesson they should be collected together in one class on a gallery, or by some similar arrangement.

"You will carefully prepare each week the notes of one or more lessons, to be then delivered to this aggregate class, in explanation of some natural phenomenon. Such subjects as rain, dew, winds, hail, hoar-frost, snow and ice, eclipses, thunder-storms, the aurora-borealis, meteors, falling stars, would form the subject of one series of lessons. Another might consist of the explanation of the breathing of animals, of plants, the sources of the nourishment of plants, the balance of organised nature as respects plants, animals, and men, &c., &c. The nature and uses of soils, the use of moisture, of drainage, of pulverisation of soils, properties of pulverised soils as respects gases and the mineral food of plants, the nature of different manures, and the mode in which each promotes fertility.

"These lessons must be given in the simplest language, with the least possible use of scientific terms. They should be the subject of questioning at the close of each lesson. Notes should be taken by all who are competent, and an examination on the subject of the preceding lesson should occupy a few minutes at the beginning of the time allotted to this instruction.

"As far as possible, such lessons should be illustrated by diagrams, drawn boldly by yourself, on large sheets of cartridge paper pasted together.

"Whenever it is possible to illustrate the lecture by some scientific apparatus or experiment, that should be done.

"If you find that any of these subjects are well-treated in any of the class reading-books in use in the Institution, you will do well to have this chapter read by the class, and to make your lesson consist of a development and illustration of this reading-lesson. The text should then be made a subject of separate study by the members of the class, and they should be invited and encouraged to purchase, for their own use, the class reading-book containing the lesson. The Committee of Council will facilitate this by allowing for books so purchased the large discount of 40 to 45 per cent., if they are on the published list of the Council.

"Saturday evenings will be devoted to a course of lessons on some subjects of natural science with which you are familiar. In the present state of the evening classes, and of the Union, the Council limit each course to a series of four such lessons. When they have been delivered at one Institution, you will proceed to give them at such other Institution as may be appointed by the Council, on four other Saturday evenings.

"The Council have selected as your subject for the first course of lessons, the 'Atmosphere,' chiefly because of the importance of the right understanding of sanitary arrangements in everything affecting the air we breathe.

"Your four lessons will consist of an explanation of the chief properties of the atmosphere:—1. The physical; 2. The chemical; 3. The mode in which the air degenerates by chemical and physical impurities; 4. By miasmata, and the best means of removing or preventing each form of evil.

"The Council recommend you to encourage the young men who attend these lessons to take notes. You should also be prepared to question them, but in a very simple form, and with abundant encouragement and aid, so as to enable them to carry away the chief facts and principles of your lessons. If any of your pupils are sufficiently advanced to write out what they can remember of the lecture, the Council would be prepared to reward such efforts by some mark of approbation.

"The Council have provided such apparatus as will be required for the illustration of this first course of lectures, which you will repeat throughout the Union. When that course has been completed, you will be furnished with apparatus for another course.

"Having thus devoted your first course of four lessons to 'Air,' it may be desirable to deliver four lessons in a subsequent course on 'Water,' chiefly with a view to give a clear knowledge of the composition and uses of water; of the common modes in which it is beneficial or hurtful to vegetable and animal life, whether as a solvent, or in the form of vapour, dew, rain, or stagnant on the surface, or in the interstices of the soil."

EXHIBITION OF 1861.

The following is extracted from the *Builder* :

"Public opinion appears to be steadily accommodating itself to the idea of an Exhibition of Art and Industry in 1861, and doubtless, when the Council of the Society of Arts reassemble, they will take some vigorous steps to put the matters in train. Something has been said about holding the Exhibition in Battersea-park, near the terminus of the West-end Railway. We trust, however, that no such notion will be entertained. The site in possession of the 1851 commissioners at Kensington and Brompton would be far superior, and indeed is specially marked out as the right place for the first of the decennial Exhibitions born of that of 1851."

MECHANICS' INSTITUTE, ROXBURG, MASSACHUSETTS.

This Institution has been in existence about a year and a half, and a brief statement of its progress may not be without interest.

The want of a Mechanics' Institute in Roxburg, was first suggested to several intelligent mechanics who had participated in the benefits derived from similar associations elsewhere. On making known their views, they were speedily joined by others who felt the same need. The objects which the founders of this Institution had at heart, to use their own language, were these: To create a more social feeling among mechanics; to supply some intellectual source of amusement and employment common to all; to awaken dormant talent; and to elicit such information, and to give such special instruction to the artisan, as will tend to the most successful execution of the details of his business, excluding everything which might appeal to sectarian, national, or political prejudices. To promote these desirable objects, a class has been formed for instruction in architectural and ornamental drawing, under the supervision of a gentleman who is an accomplished master of that art, as well as a skilful practical mechanic, and a debating class has been established, which is found to be of great benefit in enabling its members to express their ideas fluently and with self-possession. It is also proposed, if required, to open classes for instruction in Arithmetic, Algebra, Geometry, Grammar, &c., to all of which sons and apprentices of members, as well as members themselves, will be admitted free.

Several courses of lectures have been delivered, and some of which, members, with their families, have had

free admission; a reading room has been opened, and well provided with newspapers and magazines, to which members can have access every evening; and a library has been collected partly by donations, and partly by purchase, consisting of histories, biographies, travels, expeditions and surveys, and a few works of fiction, also many books valuable for reference, being reports published by order of the general and state governments, and others of a scientific and mechanical character.

Two hundred and ninety-eight persons in all have belonged to the Institute since its formation.

Of this number there were:—8 Apothecaries, 1 Architect, 3 Bakers, 1 Brewer, 3 Booksellers, (one of whom is a Book-binder), 1 Brass Moulder, 1 Brass Finisher, 8 Book Keepers, 1 Box Maker, 4 Boot and Shoe Makers, 1 Blacksmith, 1 Broker, 1 Builder, 1 Bank Commissioner, 41 Carpenters, 1 Cabinet Maker, 4 Carriage Builders, 1 Carriage Painter, 14 Carriers, 1 Cashier, the City Clerk, 7 other Clerks, the City Treasurer, the City Marshal, 6 Clock Makers, 2 Coal Dealers, 1 Chemist, 1 Cigar Maker, 2 Clergymen, 1 Confectioner, 1 Designer, 2 Editors, 1 Engraver, 1 Fringe Weaver, 1 Furniture Dealer, 1 Fish Dealer, 1 Farmer, 2 Grocers, 1 Hatter, 1 Hard Ware Dealer, 4 India Rubber Workers, 1 Iron Founders, 1 Junk Dealer, 2 Lithographic Printers, 1 Lawyers, 21 Machinists, 5 Masons, 1 Manufacturer, 1 Moulders, 19 Merchants, 1 Organ Pipe Maker, 1 Paper Hanger, 1 Paper Stainer, 8 Plasterers, 5 Physicians, 2 Picture Frame Makers, 3 Pattern Makers, 13 Painters, 1 Printers, 1 Provision Dealer, 18 Piano-Forte Makers, 1 Pump Maker, 2 Policemen, the Post Master, 2 Patent Leather Japanners, 5 Rope Makers, 1 Stair Builder, 1 Surveyor, 1 Silversmith, 3 School Teachers, 1 Stable Keeper, 2 engaged in Sawing and Planing, 4 Tin Plate Workers, 3 Tailors, 1 Teamster, 3 Wheelwrights, 1 Wood Turner, 18 persons whose occupation is not known, 1 minors, not engaged in any trade, and 5 gentlemen living on their income.

An Institution of this kind must expect to meet, for the first year or two, with much to retard its progress; many will not join it until they see it established beyond the possibility of a failure; and many more who do not connect themselves with it, will feel disappointed if they cannot see it carried into successful operation at once.

This enterprise was something entirely new to most of those who undertook it; the Directors were almost entire strangers to each other, almost wholly ignorant of one another's capabilities, of the peculiar wants or wishes of the members, and of the best methods of putting such plans as might be adopted into practice. All of these obstacles, time has, in a great measure, removed; and the usefulness of the association becomes more apparent, just in that degree has it gained the favourable opinion of mechanics and the public.

JOINTED SHIPS.

An important innovation in steam shipping is now being carried out by the Jointed Ship Company, who are running the "Connector," a jointed steamer, in the London and trade. The vessel is built in three distinct sections or compartments, on the plan patented by Mr. MacSweeney. The sections are coupled together by a joint of great simplicity and enormous strength, which admits of instantaneous disconnection of any one section from the others when required. One section contains the engine and the crew, and the other two are exclusively cargo sections. On this system the joints are all made to one gauge, so that the engine section can be applied to any number of other sections or vessels. The commercial advantages obtained by this novel system of steam shipping are stated by the projectors to be the facility afforded by avoiding the detention of the present costly marine engines and staff during the loading and unloading of cargo and repairs of tonnage, as the jointed engine section can

always be transferred from one vessel to another joint, as the locomotive is from one train to another. The feature of this plan is that on long steam routes by river, lake, or coast, cargo sections can be picked up, jointed on, and taken forward or disconnected and left behind, with about as little delay as a railway train can be increased or diminished. A further advantage claimed is that jointed vessels (up to 2,000 tons) can be constructed of so light a draught—say five feet—that their sections may be loaded at inland ports and proceed, by shallow river, lake, or canal, to a seaport, there be jointed to the engine section, and take their cargoes direct over sea, avoiding the expense and delay of transhipment. The "Connector" has recently made a successful voyage to Hartlepool, and has discharged a cargo of coals from that place in the Regent's-canal dock.

DISEASE OF THE SILKWORM.

The committee appointed by the Academy of Sciences to investigate the cause of the diseases of the silkworm, and seek a remedy for them, recently met to receive the report of the three members who had been specially charged with the duty of investigating the subject in detail. The reports of MM. Decaine and Péligot, which had particular reference to the state of the mulberry leaves, were very short, but M. de Quatrefages has conducted a number of observations and experiments of a very interesting and important character. Having visited various parts of France, he found the mulberry leaves in excellent condition, from which it appears that the source of the disease is not to be attributed to bad food. The disease called by M. de Quatrefages *maladie de la tache*, from the spots which appear on the worm when attacked with it, is that from which these animals principally suffer. These spots are often invisible to the naked eye, and can only be perceived with the aid of a magnifying glass; and this circumstance explains why the malady, especially during the present year, escaped the observation of silk-growers in the majority of cases until five or six days after the worm had cast its fourth skin. The spots exist in all the tissues and organs of the worm, and in its subsequent stages of a chrysalis and moth. In the latter, the spots destroy the antennae, the legs, or a portion of the wings. In the beginning, the spot appears under the form of a yellowish matter pervading the whole system; this matter gradually becomes darker, and is then concentrated into a number of tubercles, which are the spots in question. That such a diseased state should exercise an influence on the quality of the eggs is not surprising, but to what extent can only be determined by future experience. An infected silkworm may spin its cocoon when the disease is not too far gone, but the insect generally dies, and the body, instead of putrefying, becomes dry and brittle. Several methods of cure have been tried: first, the hygienic process, which consists in rearing the worms in open sheds instead of close rooms. The leaves of the wild mulberry, not stripped from the branches, have been found very efficacious. Silk-growers are recommended to rear small lots of worms apart from the others, solely for the purpose of propagating the species. Various medicines have also been administered to the worms. It appears that the silkworm does not refuse to eat the leaves of the mulberry sprinkled with Peruvian bark, valerian, mustard, &c., and the two latter powders especially would seem to produce good effects. Scraped sugar, however, appears, for the present, to be preferable to all other remedies. Experiments with this substance were accordingly repeated on a larger scale in an establishment where one of the silk sheds fitted up for 27 trays was reduced by disease to four. The worms of these were transferred to another shed, and divided into four lots; the first was fed in the common way, the second with moistened leaves, the third with sugared leaves, and the fourth was subjected to a rigorous abstinence from food

for a considerable time, and then fed chiefly with sugared leaves. At the end of 24 hours, several worms of the latter lot began to spin, and made several small and imperfect cocoons; the other worms began to shrivel up and diminish in size; but on receiving the sugared leaves, they speedily rallied, and many of them spun their cocoons. The worms fed with moistened leaves fared very badly, and very few of them spun cocoons. Those fed in the common way presented nothing remarkable, and yielded a certain quantity of cocoons; but those fed with sugared leaves thrived well and spun their cocoons sooner than the others. The quantities of silk yielded by these four lots were respectively: 1st lot, 210 grammes; 2nd lot, nothing; 3rd lot, 392 grammes, and of a superior quality; 4th lot, 152 grammes. It seems to be thus established that medicines may be administered to silk-worms with results which may be considered very promising.

Proceedings of Institutions.

BRADFORD (YORKS).—In the twenty-sixth annual report of the Mechanics' Institute presented to the members at the last annual meeting, the committee regret that the terms of encouragement with which for the last few years they have been accustomed to preface their remarks, cannot on this occasion be quite so appropriately employed. There has been a decline in the number of members, but it is some satisfaction to know that this has originated in no deficiency in the number and value of the privileges enjoyed; but it is almost entirely attributable to the very severe depression in trade. Under these circumstances, therefore, the committee confidently hope that, on the advent of more favourable times, the Institute will recover the ground it has lost. The following is a comparative statement of the number of members for the last two years:—

	March 31, 1857.	March 31, 1858.	Decrease.
Life Members	128	128	—
Members at 12s. per annum ...	496	476	20
Subscribers at 10s.	198	153	45
" 8s.	394	326	68
Females at 6s.	86	64	22
Firms... ..	12	11	1
Persons nominated by firms ...	94	82	12
	1408	1240	168

The financial position of the Institute presents a very favourable aspect. The gross income of the year, including £69 9s. 6d. the balance of last year's accounts, has been £761 10s. 9d., and the expenditure £690 11s. 7d., leaving a balance in favour of the Institute of £70 19s. 2d. The news and reading-rooms continue to maintain their popularity among all classes of the subscribers. During the year the usual number of newspapers, magazines and reviews have been supplied; the committee have also continued the telegraphic intelligence, feeling satisfied that rapid information on important events has now become a necessary element in the arrangements of a news-room of any pretensions to completeness. The additions to the library during the past year have been:—By purchase, 250 vols.; by bound periodicals, 44 vols.; by donations, 16 vols. Thirty-three volumes have also been purchased to replace worn-out books. The number of volumes at present in the library, after deducting the loss of twenty-seven volumes incurred by change of editions and by the erasure from the catalogue of books worn-out and superseded by later information, is 6,944. The general summary of the issue of books, as compared with that of the previous year, presents a decrease of 2,575. Considering, however, the decline in the number of members, and the fact that this has occurred chiefly among those classes of the subscribers who make most use of the library, the result is one which might be fairly anticipated, and affords no evidence of any diminution in the reading habits of those who continue to subscribe. The proportions of books issued in the several departments of literature are fully stated in the following table:—

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Esq., M.A., "Beau Brummell;" * Mr. S. H. Kerr, "Electric Telegraph;" Mr. J. K. Applebee, "Douglas Jerrold;" Mrs. G. L. Balfour, "Celebrated Women of England, America, and France;" Mr. W. Richardson, "Electricity, Galvanism, and Pneumatics;" Geo. Gross-smith, Esq., "Pickwick Papers;" and "English Notions of American Character;" * Rev. S. G. Green, B.A., "Old Times: how to understand them, and what they teach;" * Rev. J. Fawcett, M.A., "On some of the Former Inhabitants of our Old Town and Neighbourhood." The classes have been in full operation during the session, and the number of them similar to that of the previous year. In the principal class—that for writing and Arithmetic—the attendance has been very good, and the teachers report that in point of usefulness and efficiency it has never previously been in better condition. The addition of two new class-rooms, which were fitted up early in the session, one of which was appropriated to the use of this class, has materially contributed to this result, as the teachers have thereby been enabled to effect a more complete subdivision of the class according to the age and attainments of the pupils. The grammar and reading classes form another feature in this department, to which too much attention can scarcely be paid. Examinations by the Civil Service Commissioners, and those conducted by the Society of Arts, have plainly demonstrated how urgent is the need for a thorough inculcation of the first principles of orthography and English composition, without which any aims at higher attainment must be inevitably impeded, or altogether prevented. Much attention has been given during the past session to these important subjects. The committee express an opinion that it would be well if a class exclusively devoted to writing from dictation, were permanently established. The higher classes have been efficiently conducted, and the attendance of pupils very regular during the Session; the female class forming the only exception to this remark. In this class the reduction of members became very great during the last quarter. The following table gives the number of pupils, and the average attendance in the classes taught during the past session. The classes marked by an asterisk were taught by gratuitous teachers, to whom the Institute is very greatly beholden for their valuable services:—

Name of Class.	No. on Books.	Average attendance.
Writing and Arithmetic	203	120
Reading—two Classes	74	56
*Elementary Grammar:—		
First Section	37	21
Second Section	18	10
*Advanced Grammar	40	23
*Higher Grammar	15	11
*Geography	22	15
*English History	15	10
*Mathematics	13	8
*Bookkeeping	18	13
*Chemistry	10	9
*Latin	7	4
French—Four Classes	42	40
German—two „	13	11
Drawing	37	30
Female Class	42	23

The usual annual soiree was held in the theatre of the Institute, tea being previously served in the news-room to about two-hundred of the members and friends of the Institute. The president occupied the chair, and distributed prizes to the successful students in the classes.

SYDNEY (NEW SOUTH WALES).—The report of the Sydney Mechanics' School of Arts for the past year, states that its prosperity may be considered as unimpaired, for the slight decrease in the number of mem-

bers is less than might have been anticipated from the late depression of mercantile interests. The committee point with satisfaction to the multiplication of provincial Institutions, of which this society may be considered the parent. The extent to which the reading-room is frequented, affords full justification to the committee for the heavy expenditure which that improvement necessitated. The evening attendance is already sufficient to occupy it fully, and a moderate increase in the number of readers will demand additional space. The condition and wants of the library have had a large share of the committee's attention. They found that a considerable infusion of fresh books was required, not merely to make good the actual wear and tear caused by the rapid circulation of well-known works, but also to keep pace with the intelligence of the day. The opportunities of procuring desirable publications in the colony have proved insufficient, and though the committee have expended the sum of £85 16s. in purchasing on the spot books most urgently needed, yet they do not consider a reliance upon this market to be prudent, and they have directed their attention to the mother country for better supplies. Already the sum of £100 has been remitted to a large house in the book trade, with a corresponding order. The committee have also voted £60 to be expended under the care of the Society of Arts in England. The additions of all kinds to the library, during the year, are about 653 volumes, making the present stock about 6,500 volumes. The lectures still retain the character which Lord Brougham, borrowing a medical term, describes as "sporadic." Even in England, with its abundant supply of able and willing lecturers, Mechanics' Institutes have found it necessary to associate themselves into unions, in order to secure continuous courses of lectures from competent teachers. The committee feel that a more systematic course of instruction would be highly desirable, but the condition of the society in the colony has hitherto rendered this impracticable. The aid accorded by his Excellency the Governor-general, the patron of the Institution, demands especial recognition. The list during the year comprises:—"Introductory Lecture," Dr. Woolley, Principal of the Sydney University; "On Elocution, with illustrations from Shakespeare's plays," Mr. John Connery; "On the friendly Interchange of Nations," The Rev. John West; "On Common Salt," Dr. Smith, Professor of Chemistry at the Sydney University; "Photography," Frank Haes, Esq., Member of the Photographic Society of London; "The Distinguishing Characteristics of the Present Age," C. Smith, Esq.; "The Phenomena of the Tides of the Pacific Ocean," Captain M. Denham, F.R.S., of H.M. Surveying Ship, *Herald*; "Animal Magnetism," Mr. F. M. Thompson; "The Aborigines of Australia," J. H. Palmer; "The History and Use of Music," Dr. Hoelzel, Chief Rabbi; "Land Surveying," His Excellency Sir William Thomas Denison, K.C.B., Governor-General; "The Microscope, its Uses and Results," George Walker, Esq.; "The Analogies existing between sound and colour, with a description and comparison of the organs of vision and hearing," J. D. Macdonald, Esq., H.M.S. *Herald*; "Savings' Banks," Christopher Rolleston, Esq., Registrar-General; "Life and Writings of William Shakespeare, with musical illustration," A. J. Mason, Esq.; "Ventilation," Isaac Aaron, Esq., Health Officer of the City of Sydney; The Revolt in the Bengal Army," Dr. Berncastle; "The Modern Doctrine of Protection to Native Industry," W. G. Pennington, Esq., Vice-President; "The Political Economy Proper for New South Wales," W. B. Allen, Esq.; "Civilization," A. Bennie, Esq.; "The Poetry of Charles Harpur," D. H. Deniehy, Esq., M.L.A.; "Description of a Voyage to Norfolk Island, with an account of the Pitcairn Islanders settled there," His Excellency Sir W. T. Denison, K.C.B., Governor-General; A Special Lecture on the "Meaning and Tendencies of the Present Age," kindly delivered by E. Maitland, Esq., President of the

Goulburn School of Arts. The classes at present in operation, are,—a French class; a Drawing class, in which, during the past year the majority of the pupils have attended to Mechanical Drawing, a department of special value in reference to the development of the sources of colonial wealth; a Mathematical class; a German class; a class for instruction in Elocution; one for Instrumental music; Singing classes; a Latin class; and a Discussion class. The committee say, however, that they cannot congratulate the society upon such a general development of the class system as might be desired. The subjects of study are few and limited; nor does the attendance in the several class-rooms indicate any great zeal or interest on the part of the general body of our members. The committee add:—"This is an old complaint in similar institutions. It flows naturally from the peculiar circumstances of disadvantage under which our pupils for the most part pursue their studies. Their work is much harder than that of scholars in Colleges or Universities, whilst they enjoy none of those encouragements by which academic diligence is stimulated and rewarded. An attempt has been made in England to remedy this evil by examinations and rewards to meritorious students. These examinations in the London Society of Arts have assumed a very elaborate character, and are recognised as conferring a distinction only second to University diplomas. It is worthy of consideration whether this system may not be wholly or partially adopted in our own Society." "The attention of the committee has been earnestly directed to the subject of competitive exhibitions of useful invention, similar to those which have been so effectively employed by the London Society of Arts in stimulating scientific and literary industry, and developing the material resources of the country. A sub-committee has been appointed, with instructions to draw up a scheme for carrying this project into effect, and upon their recommendation the committee offered for competition four medals. Of these, two were assigned to the mechanical arts, and the subject selected for the present year was "Model Dwelling-houses for the Labouring Classes," especial regard being had to the peculiar circumstances of the colony and to economy. The others were allotted to pictorial and plastic arts. Two gold medals were added by individuals, one by Dr. Woolley, for the best essay upon a literary subject; the second by A. T. Holroyd, Esq., for the best model of a machine to extract the stumps of trees from the earth. The following is a comparative statement of the number of members on the books in each quarter, for the years 1856 and 1857:—

In the first Quarter, 1856, there were	646;	in 1857, 667.
Ditto second ditto, 1856, "	769;	" 1857, 751.
Ditto third ditto, 1856, "	999;	" 1857, 911.
Ditto fourth ditto, 1856, "	1035;	" 1857, 952.*

It appears by the accounts that the revenue has sufficed for the year's expenditure, but has not left any surplus. The committee closing their report desire to bear testimony to the energy and ability of the late secretary, Mr. Joseph Dyer. The vacant office was applied for by forty different gentlemen. From these the committee have selected Mr. William Davis, whose antecedents lead them to believe that he will prove an efficient officer.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Aug. 27, 1858.]

Dated 21st July, 1858.

1863. A. Taylor, 1, Wallington-cottages, De Beauvoir-town, Kingsland—Imp. in pianofortes.

* To which must be added a considerable number who have neglected to take up their tickets punctually on the expiration of the term, say 150; making a slight increase of members on the 31st December, 1857, over the 31st December, 1856.

Dated 4th August, 1858.

1773. C. M. Archer, 3, St. James-gardens, Haverstock-hill, Haverstock-road—Imp. in electric and submarine telegraphic cable and wires.

Dated 11th August, 1858.

1825. S. F. Cottam, Manchester—Imp. in machinery for combing cotton and other yarns or threads.

1827. J. B. Foyle, St. Dunstan's Works, Conway-street, and J. C. J. Boyes, and J. Clough, Ebenezer Mill, Mill-lane, Bedford—Imp. in machinery or apparatus for combing wool or other fibrous materials.

1829. R. A. Broome, 164, Fleet-street—Imp. in time-keepers. (A com.)

Dated 12th August, 1858.

1821. W. Meekel, Friday-street—Imp. in textile fabrics.

1833. J. Scott, Shoreham, and A. Martinod, Brighton—As improved steam engine.

1835. J. H. M. Malaisit, Paris—Imp. in wheels.

1837. J. Fogg, Great Lever, near Bolton, Lancashire—Imp. in pressure gauges.

1839. A. J. Paterson, Edinburgh—An imp. in propelling ships and vessels.

1841. E. Smith, Dudley Port, Tipton, Staffordshire—An imp. in puddling iron.

1843. H. Smith and T. W. Ashby, Stamford—Imp. applicable to haymaking machines, whereby such machines are rendered useful for other agricultural purposes.

Dated 13th August, 1858.

1845. W. B. Nortcliffe, Fellgrove, near Huddersfield—An imp. in dyeing woollen, worsted, cotton, silk, linen, and other textile fabrics and fibrous substances.

1847. F. J. Manoeuvre, Paris—Imp. in stocks for fire-arms.

1849. T. Rickett, Castle Foundry, Buckingham—Imp. in locomotive engines and other carriages to facilitate their transit.

1851. T. Worth and H. Spencer, Rochdale—Imp. in machinery or apparatus for preparing for spinning, and for spinning, carding and other fibrous materials, in winding and warping yarns the said materials, and in making wire cards for such preparing machinery.

1853. J. H. Johnson, 47, Lincoln's-lane—Imp. in the treatment of crude india-rubber, gutta percha, or other vulcanisable gums, and in the manufacture therefrom of what are usually called hard rubber articles. (A com.)

Dated 14th August, 1858.

1855. J. Carimel, Stamford-street—Imp. in the manufacture of hats, caps, and other coverings for the head.

1857. J. Holt, Shelf, near Halifax—Imp. in looms.

1859. A. Slate, Adelaide road, Haverstock-hill—Imp. in blast furnaces and in smelting iron ore.

1861. C. O'Neill, Manchester—Imp. in the manufacture of crochets, gums from starch farina, and other amyloseous substances, and in apparatus for such manufacture.

1863. W. E. Newton, 66, Chancery-lane—An improved combination of metal with india rubber or gutta percha, or with india rubber or gutta percha combined with other substances in the manufacture of belting, hose, valves, and other articles.

INVENTION WITH COMPLETE SPECIFICATION FILLED.

1860. A. V. Pinto, 63, King William-street—Imp. in blank promissory notes or drafts on bankers, payable on demand, ready to the crossing of such cheques or drafts.—16th Aug. 1858.

WEEKLY LIST OF PATENTS SEALED.

August 27th.

391. L. Gall.
397. J. G. Newey and W. M. Newey.
399. A. von Schuttenbach.
401. J. K. Field.
403. H. M. Platt.
406. J. Billing.
407. J. Skelly.
408. J. Bircumbshaw.
410. A. Ripley.
412. W. Hooper.
417. J. P. Budd.
493. F. A. Verdell.

500. T. Thompson.
523. J. Hamilton, jun.
542. W. B. Clark.
545. T. C. Hine.
625. W. B. Clark.
631. F. Haack.
647. E. A. Jacquet.
665. M. A. F. Mennessier.
1034. A. V. Newton.
1291. A. Rebertson.
1402. W. H. Newton.
1438. J. Taylor.
1499. J. Chisholm.

PATENTS ON WHICH THE STAMP DUTY OF £40 HAS BEEN PAID

August 23rd.

1921. G. Schlickaynes.
1926. W. Brown.
2008. W. Southwell.

August 24th.

1927. C. F. Stansbury.
1928. E. Carless.

August 25th.

1941. W. Johnson.

August 26th.

1964. P. E. Charlton.
1976. A. I. Antep.
2002. W. De la Rue.
2006. J. Stewart.
2032. E. R. Feather.

August 27th.

1943. C. Esplin.
1944. E. N. Foxton.
1964. C. Roddick.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 10, 1858.

NOTICE TO INSTITUTIONS.

The Prizes and Certificates awarded at the examinations held in May last, have been forwarded to the several Local Boards for distribution.

Copies of the Programme of Examinations for 59 may be obtained on application to the secretary of the Society of Arts.

ENGRAVING.

An invention has recently been patented in this country, for preparing the surface of an engraved copper-plate so as to render it capable of holding a greatly increased number of impressions. It is stated that upwards of ten thousand impressions have been taken from a plate thus prepared. A description of the process will shortly be given in the *Journal*.

ON THE MANUFACTURE OF AUSTRALIAN WINES.

By P. L. SIMMONDS.

The recent samples of raisins and olive oil from Western Australia, and the trade opinions thereon, published in the *Journal*, have drawn my attention to the effect of new colonial products suited for export, and I could have been glad if the long continued efforts of the Society, by the offer of premiums and the suggestions thrown out, had resulted in some greater degree of success and more extensive results among the colonists. Western Australia has, it is true, laboured under many disadvantages of want of labour and capital, and been sadly in the background by the superior attractions of the gold-fields of Victoria and New South Wales, the mining and agricultural operations of South Australia.

Not fifteen years ago, my friend the late Mr. R. W. Dale, an earnest and devoted friend to improving the colony and developing new resources for the colony with which he was identified, established at Perth a Vineyard Society, for the following objects:—

To ascertain and preserve the numerous varieties of grape-vine now in the colony.
To introduce all such useful varieties as we do not at present possess.

To prepare and publish information on the best management of the vine, and manufacture of its produce.
To encourage the formation of vineyards, and the manufacture of the produce.

To obtain periodically from the members of the Society such observations as may have occurred to them on the treatment of their respective vineyards, the quality of their vines, &c.; so that the committee may be enabled to communicate to the public the general results.
To obtain and preserve a high character for the wine, brandies, Zante currants, and raisins of Western Australia, by discountenancing the exportation of inferior qualities, and by the society's brand accrediting superior.

To form a model vineyard, where all attainable varieties of the vine should be preserved and propagated,

for the purpose of trying experiments on their treatment, and on the manufacture of the produce, as well under various treatment, as with various combinations of grapes, and from which cuttings should be furnished to the members at a fixed rate.

At the first meeting, held the 8th June, 1843, a beautiful sample of Zante currants, in their dried state, which had preserved the bloom uninjured, and produced in his own garden, was shown—and much admired—by Mr. Mackie.

And yet, in the long interval that has elapsed, when the suitability of the soil and climate, and its capability to produce grapes, raisins, wine, olive oil, and other important products, have been fitly proved, how little has been really done, in a commercial point of view, either for local consumption or export. While there is little encouragement for the shipment of dried fruit to England, owing to the long voyage and the heavy charges, there are excellent markets at hand, as consumers, in the various Australian Colonies, and in Mauritius and Bourbon. But the colonists seem too prone to rest satisfied with putting the matter of successful production simply to the proof, and then weary of following out the matter in a speculative point of view.

A late number of the *South Australian Register* says:—"We have been favoured with a sample of raisins, the produce of a vineyard at Norwood, which has been dried during the present season. They are plump and sugary, not too much dried, and rich in flavour. If raisins of this quality can be produced here in abundance, and there is no reason to suppose that they cannot, Australian housewives ought not to be long compelled to pay one shilling a-pound for their fruit for puddings. We sincerely hope that this branch of industry may be extended, as well as wine-making and spirit distilling, so that the produce of our vineyards may be turned to the best possible account, both to the growers and to the community."

It is remarkable that a process so exceedingly simple as that of drying grapes so as to produce raisins, should not be more attended to in the southern colonies for the purposes of trade and commerce.

For this purpose it is only necessary to raise mounds of earth against a wall so as to present a sloping surface towards the meridian sun, at an angle of about 30° or one-third of a right angle. The bare red soil—warmed by solar heat, kept dry, and protected from rain or dew, is considered to possess properties for drying the grapes into raisins preferable to any other sort of surface, or any artificial heat. A useful sized slope is one about 26 feet from the upper to the lower horizontal line, and of the same width. This should be divided into two compartments of 12 feet wide (leaving 2 feet between them) by two planks fixed on edge and supported by stakes and cleats at the lower edge. Down the middle of each compartment should be a central sleeper to support covering boards, which ought to be cleated so as to be kept in their places, and overlap so as to form a boarded roof for each partition. These boards must be lifted on every evening, and taken off every morning, and laid on whenever rain is about to fall. The grapes should be laid down in separate bunches on the naked earthy surface, where, in the space of from six to twelve days, they will become brown; they must then be turned—once turned only—and in from two to three weeks in the whole they will be converted into raisins. In turning the grapes care should be taken to touch the fruit as little as possible. In order to prevent the contact of ants, it will be necessary to surround the basis of the slope on every side with water, which a very little ingenuity will contrive without affecting the dryness of the mound.

Few people are, perhaps, aware of the amount of the revenue derived by Spain from this article of commerce alone. The country consuming the most of the raisins thus produced is North America. Next comes England, then France.

Then, again, in the matter of Australian wines, which

would pay well for shipment, or even for local consumption if due attention were but given to the culture, management, and preparation of the wine. We have seen what an impetus has been recently given to Cape wines here, and those not of the best, but cheap colonial wine would always find a market, and take the place of much of the inferior continental wines.

The cultivation of the vine in Australia is as yet only the pursuit of a few wealthy landowners, who carry it on in the spirit of amateurs, as a branch of horticulture. It is more a fancy than an industry; and has not told with any appreciable effect on the taste or commerce of the colony. Hence, though we hear frequently of the wine of Australia, it is all sample and no bulk. It figures prominently in reports, as recently in Paris, and in nearly all the books about the colony; but it has not yet found its way into the ledgers and cellars of "the trade." The few wine-growers of the colony are too easily satisfied with proving that it can be produced, and it must be admitted they have proved it. But the period of experiment in this matter has exceeded all reasonable limit. The work wants a little pushing from the spirit of gain. Industries that pester on in the state of infancy for a generation are apt to be alighted and forgotten; dwelling continually in the region of expectation and promise, they rank at last with the sea serpent and the "coming man." In some such limbo is the wine trade of Australia, and there it is likely long to remain.

The last official return of the number of acres under cultivation with the vine in New South Wales, states it as a little above 1,000—about half the area of a single farm in the colony. Most of the produce is consumed in the establishments of the growers, but much of this small producing power is wasted by their mania for imitating or rivalling the choicest European varieties, and the struggle to obtain identity with them in colour and flavour. If there is any little surplus the public know nothing of it, the growers, as a body, having taken no effectual steps to make it accessible.

One may be long in the colony itself without hearing that such an article exists. The city of Sydney is populous and wealthy, by no means averse to vinous fluids in any form, but indeed rather remarkable among capitals for chronic thirst—the climate conducting thereto. It supports a host of wine agents, wine merchants, and wine firms. Auction sales of wine are advertised daily in the local papers. A transaction of 10 minutes will stock your cellar with the "best brands" of all the wines in the universe, except those of Australia. Nowhere is the wine of the colony to be seen; even to taste it is difficult; it can only be done at a few good men's feasts, or at the houses of the growers. So may the privileged partake of rarities at the Duke of Devonshire's. But it is not an affair of commerce. There is no native wine "in the market," where only the great mass of the public can become familiar with it. There is not a shop, dépôt, or establishment in Sydney where a pint can be bought over the counter. If you were to ask an Australian innkeeper for a bottle of wine "the growth of the country," you would create as much astonishment as if you made the same demand in a Highland boothie.

The only prospect I can see of wine being (in the commercial sense) produced in Australia, is that the cultivation of the grape may, hereafter, be taken up by a class of men who will make it their trade and live by it; who will have the good sense not to imitate Chamberlain and Bordeaux, but grow a good pleasant quality, "racy of the soil," rich with its southern sun (such qualities there are), and in larger and larger quantities as the demand increases—in vintages, comprehensive measures—pipes, tuns, and butts—are what the world respects. The small annual "squeezes" that may be gauged by gallons, and only appear in public in sample bottles, are very properly treated as of no account. Let the Australian wine-growers enlarge the borders of their vineyards, cease being too curious in exquisite varieties,

and aim at quantity from the two or three sound stocks they have already obtained. When they have freighted their first half-dozen ships to the London Docks, people will begin to believe Australia is really a wine-producing colony.

A writer, speaking of South Australia, says the grape is destined to become one of the prime fruits of South Australia. It grows with a luxuriance and vigour in soils altogether unknown in Europe, and produces fruit in miraculous profusion. Every cottager, with no more pains than he would give to a cabbage, may have his vine covering his dwelling in a couple or three years, groaning with this luscious produce, and rewarding with a generosity unknown to other plants, the small labours bestowed upon its culture. South Australia may be made a wine producing country to any extent, for there is no part of the soil unsuited to the growth of the vine. Four hundred different sorts are in the colony, selected from the best vineyards of France, Italy, and Spain, and the cost of planting and preparing a vineyard would not exceed from £8 to £20 an acre, according to the locality of the soil. From 450 to 1,200 gallons of wine is the produce per acre of a vineyard in its fifth year. An acre is estimated to yield, after the sixth year, a profit of £10 per annum. The grape ripens in Australia in January, and the fruit continues to be gathered till the end of May. Raisins of very good quality have been made from the White Muscat of Alexandria, with no other trouble than cutting off the branches and laying them on mats in the sun to dry.

By the latest returns there are about 800 acres of land in cultivation as vineyards in South Australia. There can be no question of the capabilities of the colony in the production of wine. I do not mean a mere *vin de table*, but wines of a superior class. Many of the wines already produced give promise of possessing a distinctive character, together with those qualities which make them most valuable—colour, bouquet, flavour, and strength. Notwithstanding all the difficulties attendant on a process new to most of the growers, and an ignorance of the practical manipulations on which so much depends, there can be no doubt that our wines justify every encouragement being afforded to the planting of vineyards.

Mr. Landor, in his work, *The Bushmen*, says, "that is every reason to believe that Western Australia will one day become a great wine country. In ten years are becoming more numerous and extensive every year; and the wine produced in them is of a quality to lead us to believe that when the art of preparing is better understood, it will be found of very superior quality. It will, however, be a new kind of wine; and, therefore, before it will be prized in Europe, prejudices in favour of older wines have to be overcome. Soil and climate combined, give to different wines their peculiar character. The vines which in Madeira produced the wine of that name, when brought to another country, even to a corresponding latitude, and planted in a soil that chemically approaches as closely as possible to that which they left, will produce a wine materially different from that called Madeira. So with the vines of the Azores and Oporto, of Teneriffe, or Constantia. In these countries produce wines peculiar to themselves; and the wines of Western Australia will be found entirely *sui generis*. All that I have tasted, though made from the poorest of grapes, the common *uva* water, have one peculiarity; a good draught, instead of affecting the head or flushing the face, causes a delightful glow to pervade the stomach, and it is so comforting a nature, that the labourers in harvest prefer the home-made colonial wine to any other beverage. Every farm-settler is now adding a vineyard to his estate."

It is worth tracing back the early stages of grape culture and wine manufacture in the Australian colonies for present and future reference and comparison. At the meeting of the Hunter River Association, in South Wales, in 1849, Mr. Lang, of Dunmore, produced

five samples of wine, accompanied by an interesting report, which, however, is too long for insertion here at length. No. 1 was a red wine, of the vintage of 1846, made from the black cluster and red muscatel grapes, principally the former. This wine had a considerable flavour of the muscatel, but rather sharp; it was, however, pronounced by the judges to be sound, and free from acidity. No. 2 was a white wine, vintage 1847, made from the Schiraz grape exclusively; this was pronounced to be a pleasant and agreeable wine, of clear yellow colour and pure flavour, and very palatable; it was much approved, and much surprise was excited by Mr. Lang's description of the great produce of these vines this year, no less than 1,800 gallons per acre. No. 3 was a red Hermitage, vintage 1848, of which a sample had also been exhibited at the last November meeting; it had the Hermitage flavour, and was considered a good wine, but had not been allowed time to develop its qualities. No. 4 was a red wine, vintage 1848, made exclusively from the red muscatel grape; this sample had been but recently drawn from the cask; it was a thin wine, of pleasant but somewhat tart flavour; the general opinion drawn from it was that the muscatel was not a desirable wine grape, although it made excellent brandy. No. 5 was a white wine, vintage 1848, made from the Verdelho and small Reialing grape; this sample had also been but recently drawn from the cask, but it was, nevertheless, a good wine, of fine flavour, and considered to be of great promise.

Mr. Carmichael, of Porphyry Point, produced three samples, one a red wine, of the vintage of 1848, made from the Pineau Noir grape; the wine was beautifully clear, and of a rich colour, rather tart in flavour, but a very good summer wine, and without any acidity. No. 2 was a white wine, vintage 1848, Shepherd's Reialing grape; it was of fine flavour, and of a rich golden hue. Mr. Windeyer, of Kinnross, sent in a box of samples of three wines; one of which, labelled "black cluster," 1841, was a strong full-flavoured wine, pronounced to be quite sound, and of good body. A general opinion was expressed that the black cluster grape was one of the most valuable wine grapes in the colony. Samples, equally good, were sent in by Mr. King, of Irrawang. No. 1 was a red wine, of the vintage of 1846, made from the black Pineau and gray Pineau grapes, the former in much the largest proportion; this was a first-rate wine, and was by common consent so pronounced, and it was agreed that this wine would sell in the market as the best Burgundy wine, if it had a foreign name attached to it, although the colour was scarcely as deep as good Burgundy. No. 2 was a red wine, also of the vintage of 1846, and was made entirely from the Black Pineau grape; this wine was a deeper and richer colour than No. 1, and was pronounced by the connoisseurs present to be a better and fuller Burgundy wine, having the full flavour, colour, and body of the best Burgundy. Mr. Hickey's sample of brandy, although only ten days old, proved to be a very fine article of pale golden colour, and free from the fiery taste which usually marks the colonial brandy; Mr. Hickey said he could obtain about 180 gallons of such brandy from an acre of vines. Mr. Lang's brandy, distilled in 1848, was then tasted; it was of fine colour and flavour, somewhat fiery when pure, but very agreeable when mixed with cold water.

Sir Thomas Mitchell received the large silver medal offered by the Sydney Floricultural Society in 1849, for the best raisins. At their annual show there were only two sorts of wine exhibited, of which the judges reported as follows:—

"The Society having apportioned to wines the highest prize, in order to encourage the cultivation of the vine, and to bring into use generally the wines of the colony, regret to observe such slight competition.

"Only two samples of wine were exhibited, to the best of which (a white wine, made from the Verdelho grape, of the vintage of 1848), was awarded the highest prize.

At the same time the judges desire to remark, that the wine of the same class, of the vintage of 1849, possessed qualities which they have reason to believe would next year entitle it to rank with that which has now taken the prize."

There was published in 1856, in this *Journal* (vol. iv., p. 575), an interesting paper by Mr. James King, to whom the Society's silver medal was awarded, on the vineyards of New South Wales. As the subject is just now of even more interest, room may perhaps be found for the following further details.

It would be difficult to find a climate better adapted for the cultivation of the vine than that of New South Wales, or soils more suitable for it than those which everywhere abound upon its coast, particularly from Illawarra to Moreton Bay. The great elevation of much of the inland districts may not, perhaps, admit of such elevated portions producing wine, but they contain, nevertheless, many sites where vineyards would succeed, inferior in this respect as their climate is to that of the coast, if proper vines were selected. There are already many varieties in the Colony, some of which are suitable to cold and elevated sites, as proved by their successful cultivation in some of the best vineyards in Europe. What a source of enjoyment would the growth of the vine be to the inhabitants of Yass, Goulburn, Berrima, Bathurst, &c., did they but avail themselves of the natural advantages of those districts by growing wine for their own consumption. Wherever the climate is warm enough for the early or dwarf varieties of maize, wherever the peach or the fig ripen without the assistance of walls, there the situation would prove warm and sheltered enough to mature the fruit of the vine.

Site.—The best sites are the sides of gently-sloping hills, sufficiently elevated above the valleys or plains to be beyond the influence of hoar frosts in spring, and the chill humid exhalation occasionally prevalent in such situations. The first, not unfrequently in a single night, frustrates the hopes of the cultivator by cutting off the young shoots, and the last greatly retard the vintage. Experience in this branch of colonial husbandry shows that a vineyard on the side of a hill, at an elevation of one hundred to one hundred and fifty feet, will usually be three weeks or a month more advanced than vines of a like sort planted in a valley or plain at its foot.

Aspect.—The most favourable aspects for the vine in New South Wales, are those from east to north, and in the colder or more elevated regions, even round perhaps as far as north-west, but sheltered as much as possible by the ground or by thick wood from the south-south-east, round to the north-west. It is difficult to meet with a site comprehending every advantage, but the great object is to have the vineyard open to the full range of the meridian sun, without being exposed either to hot winds from west to north-west, nor to any of the strong land winds usually more or less prevalent in the spring. It is not advantageous, however, to have any sheltering wood within thirty or forty yards of the vineyard, unless it be a low hedge or shrubbery of moderate height.

Meteorological Influences.—The state and temperature of the atmosphere, at certain seasons of the year, are of great importance to the vine. In New South Wales, abundant rains during the latter part of the autumn and winter may be considered favourable, so also is occasional and moderate mild rain, until the fruit begins to swell to maturity. In the spring, as already said, the great evil to be guarded against is hoar-frost, which in low situations sometimes occurs late in the year, even in the neighbourhood of Sydney, but more frequently in the adjoining inland counties. The damage which these frosts occasion may be prevented in the following simple mode:—Small heaps of straw, rather damp, and mingled with a few shovels-full of loose earth, should be placed round the vineyard, at intervals of six or eight yards, and, if it be extensive, along some of the intersecting cart-ways. A dray-load of this short straw may be divided

into from twenty to thirty heaps. If the thermometer and the appearance of the weather overnight indicate the possibility of frost, a vigilant look-out should be commenced an hour or two after midnight. As soon as the thermometer approaches the freezing point, or falls a little below it, some heaps of the straw, say every sixth or eighth, should be lighted, and each so managed as to be kept mouldering for about an hour. The dense smoke produced is prevented from rising or dispersing by the weight of the atmosphere. As the straw burns out, fresh heaps should be lit, and care taken to reserve a sufficient number to occasion the densest smoke at sunrise and for an hour after. By adopting this precaution, the dew is prevented from freezing on the young shoots of the vine, or when frozen, they are not acted upon by the sun's rays, until thawed by the slowly-increasing warmth of the atmosphere.

With a little attention, the vine may, at no distant time, be extensively cultivated in Australia, and when that takes place, it will have a greater effect in inducing habits of sobriety than all the efforts of teetotal and temperance societies combined. Communities of vine growers are rarely intemperate in the use of fermented liquors, although, in the aggregate, they largely consume the produce of their own vineyards. Independently of this advantage, there can be no doubt that as soon as vineyards are extensively cultivated in Australia, vines will be produced rivaling the more famous growths of Europe, but until experience and skill have been acquired in the art, and the multiplied attention of individuals has been directed in this channel, it is not to be expected that wines should be produced of a quality sufficiently good for exportation. Considerable quantities of wine, and some of it of a superior kind, have already been made in New South Wales. Indeed, the ease with which the colonists generally may derive advantage from their own vineyards, is to be gathered from the fact that for some years past five and sometimes six individuals have been daily supplied at one estate in the colony with one pint of wine each, the produce of a single quarter acre of vines, forming part of an extensive vineyard. By the time these vines were in full bearing, they did not cost the sum of £15, including the original value of the land, and every outlay, with interest at ten per cent. The annual expense of cultivation, with the management of the vine included, did not exceed £5. Thus, for a sum not exceeding twenty-five shillings annually (less than one penny per day) may every colonist be daily supplied throughout the year with a sufficient quantity of sound wholesome wine. Of this description of wine, an acre of land in New South Wales will produce from 1,000 to 1,200 gallons, and about half the quantity of superior wine.

The following estimate of the profits of wine-making in New South Wales, was furnished me by a correspondent a few years ago:—

Expenses in making a Vineyard of 20 Acres in N. S. Wales.

Clearing, stumping, and levelling 20 acres of forest-land, at £5 per acre	100
Trench-ploughing ditto	40
Fencing a 4-rail fence, and carting for ditto	40
Stakes for 50,000 plants, one to each plant, 5½ feet long	125
Planting cuttings, preparing and procuring them, driving in the props, and carting manure, if any is used	70
Cellar and premises to make and keep wine in	300
Tools, vats, horse and cart	50
Add expenses for two years after-planting, before the vines bear:—	
One gardener or vine-dresser	£100
Eight labourers, at £30 each	240
Interest on the above outlay, at 10 per cent.	120
To cost at the end of two years	£1,185

If trenched with the spade, 30 inches deep, add £25 per cent. per acre more.

Annual Expense of Cultivating Twenty Acres, after the Second Year.

One gardener or vine dresser	100
4 labourers all the year, including coopering	120
Extra labour during vintage	20
50 new wine-pipes, at 80s. each (old ones will be procured for years at 7s. each)	70
Tear and wear of tools, apparatus, premises, &c.	20
Interest on outlay incurred during the first two years, at £10 per cent.	110

Annual expense

Annual Returns from Twenty Acres.

Produce of 20 acres of vines, taking the average of all the vineyards in France, being 250 gallons per English acre, 5,000 gallons at 4s. per gallon, casks not charged

Annual income

This estimate shows a profit of upwards of a hundred per cent. on the culture of the vine in Australia.

"A Vine-grower" gives the following as the estimated cost of cultivating an acre of land for the growth of grapes:—

Trenching and clearing	1
3,000 plants, at £2	6
To set 100 plants per day, 30 days, at 8s. without rations	12
To fence and rail an acre	2
Labour and management, £30 a-year, 3 years	90

Total

After standing three years, this vineyard will produce 400 gallons wine, on an average 10s. per gallon—£400 and about £50 worth of grapes, leaving a profit of £450. The profit of the fourth year will increase to double an average more every succeeding year.

Even in Victoria, with all its paramount gold digger attractions, and the turmoil of business and mining operations, the vine is making some little progress. We learn from the statistics that in 1854, there were produced in a portion of the county Grant 9,100 gallons of wine, 100 gallons of brandy, and 80,580 lbs. of grapes were sold. In 1855, 6,000 gallons of wine were made at Belperoud's vineyard, and about 2,000 gallons on Pettaval's, 200 gallons on a very small vineyard at Fyan's Ford, being upwards of 8,000 gallons in those vineyards only, but were Braguet's and other important vineyards calculated (so far as their wine price is concerned) with the above-mentioned ones, a return from 16,000 to 20,000 gallons might be set down as a year's return of native wine; and, great as the quantity appears this season, should the weather be propitious which at present is the case, a great increase will be made in the number of gallons produced last year.

Sir W. Denison, when Governor of Van Diemen's Land, took some pains to obtain information calculated to be useful to the wine makers of the Australian colonies. From these hints, contributed by Mr. T. C. Mcfield, and published in the *Hobart Town Courier and Gazette*, I take the following:—

One great source of expense attending the culture of the vine in Europe, is caused by the care required to make the grapes ripen. Even in the Tokay vineyard of Hungary, and in Italy as far south as Rome and Albano, the vines are cut low, are carefully staked and cleared at stated times of the superabundant foliage which prevents the sun's rays from warming the grapes in the ripening season. The reflected heat is used to that from a wall, and is more looked to than the direct

action of the sun's rays, under which the grapes often burn up.

A great deal of labour thus expended, together with the cost of staking, may doubtless be saved in warmer latitudes, where hands are not abundant, but the climate allows the grape to ripen without nursing. In such countries, fine wine, being a valuable exportable crop, is most desirable for the land-owners.

The average produce of an acre of grapes in Europe varies from 1 to 1½ pipes on the Rhine, to 2 and sometimes 2½ pipes in southern France, Hungary, and Italy.

The value of wine is not, however, inversely as the yield, since the finest Rhenish wines sell not unfrequently for £200 per pipe, while £50 to £70 is considered a high price for choice clarets, ports, and sherries. It is not an uncommon thing to have 25s. per bottle charged at a London tavern for Rhenish wine of superior but not of the best quality, which is at the rate of £760 per pipe. The consumption at this extravagant rate is, of course, limited; still, consumers are found, and this circumstance indicates how large a field is open to the industrious wine-grower.

The soil best suited to the growth of the vine has occupied a great deal of attention. The experience of Europe shows that the vine thrives in nearly every kind of soil, and that it is of more importance to choose a fresh broken soil than to select one of any particular composition.

In the following table, the nature of the leading vineyards is stated:—

NAME OF WINE.	COUNTRY.	ROCKY SUBSTRATUM.	SOIL.
Tokay	Hungary.	Volcanic.	Alluvial.
Auvergne	France.	Ditto.	Tufa and alluvial.
Lacryma Christi	Vesuvius.	Ditto.	Tufa.
Monte Pulciano.	Roman States.	Ditto.	Ditto.
Johannisberg	Rhine.	Clay-slate.	Alluvial.
Steinberg	Ditto.	Ditto.	Rock decomposed.
Hochheim	Ditto.	Ditto.	Alluvial.
Port	Lower Douro.	Ditto.	Ditto.
Liebfrauenmilch	Rhine.	Alluvial.	Ditto.
Bordeaux	France.	Ditto.	Ditto.
Steinwein	{ Wurzburg, in } Bavaria.	Red sandstone.	Rock decomposed.
Hardt	Rhenish Bavaria.	Ditto.	Ditto.

From the above list, it appears that a great variety of soils can yield superior wines; and we are by this circumstance confirmed in the notion that success depends more upon the treatment of the juice after it is obtained, than upon the soil on which the grape is raised.

The vine is a plant which very much exhausts the soil. It has a tap-root throwing out feeders at the side, which admit of its being nourished from manure buried at some distance from the plant. This circumstance is of great importance to the vine grower, in countries where land is not at a very high value, since it facilitates the use of the plough instead of the hand-hoe now employed to turn over the earth in the costly vineyards of

Europe. The rows of vines are easily kept far enough apart to allow a bullock to draw several furrows between them, without injuring the vines. The furrows should be eight or ten inches deep, and one in the centre might be made still deeper, into which the manure should be thrown.

The vine ought not to be allowed to form too much wood, but should be cut annually, so as to leave but a few shoots on each stalk.

In many parts of the Rhine, staking in is altogether dispensed with, and the vines are trained as low standard bushes, resembling currants. By adopting this plan, much expense is saved to the planter.

The kind of grape to be selected is matter of experiment, and the number of sorts from which good wine is obtained is almost as great as the variety of soils. The highest priced wines upon the Rhine are made from a small white grape, called "Riesling," which is an abundant bearer, and has a fine flavour. The aroma of the Muscatel grape is more powerful in the fruit, but it is not so powerful in the press, nor is it so durable in the wine as the simple delicate flavour of the "Riesling." A large white grape produces delicious and powerful wine at Budesheim, where it is said to have been perpetuated from Charlemagne's time.

The small black cluster grape, of Burgundy, is much in use upon the Rhine, in Hungary, and in Southern Europe generally. It is to be feared, however, that the French red wines are to a great extent artificially flavoured, for which purpose peach-leaves and kernels are much resorted to.

A large black grape, and also a white variety of the same kind, were much spread in Europe by the Emperor Probus, who exerted himself to improve the production of wine in the Roman Empire, with great success. The grape is found at Tokay, Malaga, Bronte, Lisbon, and Madeira.

By far the most important subject for the consideration of the wine-grower, is the proper fermentation of the juice obtained from the ripe grape.

Fermentation has several stages, as both the brewer and scientific wine-grower well know. According to the stage at which the process is arrested, the liquor obtained differs in nature; the two extremes being wine and vinegar.

The stages may be classed in the following order:—

1. Vinous fermentation.
2. Spirituous fermentation.
3. Acetous fermentation.

By fermentation in the first stage, a quantity of the sugar contained in the grape-juice combines with the oxygen of the atmosphere, and forms alcohol, which transformation is accompanied with an escape of carbonic acid gas, and a separation of the fibrous matter from the pure liquor,—the fibres, &c., forming what is called lees.

The difference between the vinous and the spirituous fermentation consists in the moderate degree of working which is required to make the wine. The wort should never ferment so strongly as to allow a rapid and violent escape of carbonic acid gas, otherwise both the flavour and alcohol escape with it, and the wine is left tasteless. A great deal of flavour can escape in this manner with comparatively little alcohol, and the wine may thus remain strong, but flavourless. This is the case in the greater part of Southern Europe; and hence the necessity for resorting to artificial flavours, which, although now managed with skill, are far inferior in every respect to the natural flavour of the grape.

A slow process is essential, therefore, to a perfect vinous fermentation. This must be ensured by the choice of a cool cellar, and by protecting the must from the too rapid action of the atmosphere.

There is no real difference between what we have called "spirituous fermentation" and distilling, except that, in distilling extraneous heat is applied to quicken the process, and drive off the alcohol, which is caught in

the receiver. In fermenting, the temperature of the mixture is raised, but the alcohol engendered is not immediately driven out. It has a tendency to escape with the carbonic acid gas, and in a warm room soon evaporates in an open vessel. When more alcohol has escaped than is necessary to preserve the sugar and other ingredients contained in the grape-juice, the third stage or acetous fermentation commences, and we obtain vinegar.

The wine-maker's attention should, therefore, be concentrated on the first stage, or that of the vinous fermentation. He must seek to preserve the flavour and the strength—and in so doing he will preserve a pleasant degree of sweetness.

The flavour in the grape lies in an essential oil, which is enveloped at the same time with the saccharine matter in the ripening berry, and which has its seat immediately under the skin. For this reason, the manner of bruising the grape is not a matter of indifference, and after many attempts to invent mills for crushing, the wine-growers have returned to the old method of treading; large leather boots, armed with nails, are kept for this purpose at most of the large wine establishments on the Rhine. The bruised grapes should be filled into horse-hair bags, when white wine is made, and placed in the presses, the juice flowing from which is immediately put into pipes or double pipes, standing on end, and furnished with a very simple and inexpensive apparatus, which ensures the preservation of both flavour and spirit, if the temperature of the cellar be kept moderate. This is no other than a small tin tube, $1\frac{1}{2}$ inches in diameter, inserted into the barrel, near the top, and projecting from it three inches, when it turns down about as much, offering the means of plunging it into a small bowl of water. The water absorbs the carbonic acid gas as it evolves, and discharges it, when charged to excess, into the atmosphere, without allowing any escape of flavour or of alcohol.

By this simple and inexpensive precaution, the finest and strongest wines may be made without any addition of brandy. But the process is rather slow. The wine may be racked off four times in the course of the first year, and twice in every succeeding year; but it is needless to keep it in casks furnished with the tube after the first racking, the proper time for which is indicated by the cessation of all escape of carbonic acid gas through the tube.

The process of ripening is one of slow fermentation carried on in the cask, which absorbs the carbonic acid gas, but likewise without injury to the flavour. The period when the wine can be sent to market or shipped, depends on a nice adjustment of the balance between the alcohol evolved, and the quantity of sugar contained in the wine. Of course, the balance is not established until alcohol enough is developed to preserve the other ingredients.

Wines in which this balance has been destroyed by loss of alcohol, in consequence of too rapid evaporation, must be brandied, to make them stand the voyage,—a process which is wholly unnecessary if the directions respecting the fermentation here given are punctually followed.

S, Winchester-street, S.W., Sept. 4.

SMALL PARCELS POST.

The Secretary has received the following communication from a Postmaster in one of our principal towns:—

SIR,—With reference to your letter of the 10th ult., enclosing a copy of the Report of the Committee of your Society upon a Parcel Post, I beg to say that I had already come to an independent conclusion in favour of such a project.

No doubt the introduction of parcels disturbs the natural action of the Post-office, which is intended for letters only. But inasmuch as we have always carried newspapers, which are nearly as awkward as closed parcels

would be, we have not been entirely confined to letters. Newspapers, and the generality of book parcels, are not things of intrinsic value. The Post-office does not profess to carry parcels containing value. It allows such things, because they come under the denomination of letters. The Post-office, moreover, provides, by registration, for the security (to a certain extent) of such letters as the public wish to be secured. When a person comes to complain that a letter containing value is lost, our answer is that such things should not be sent. But if we invite the public to send such things the same answer cannot be made. We should not have induced the sender to trust the department with his parcel without taking reasonable means towards securing its safety. The question is,—whether we should not aggravate the great standing blot of the penny post by increasing the quantity of things worth stealing? I am inclined to think not. First, because the great majority of real losses are of coin—coin ineffectually concealed. If a parcel of four ounces can be sent for a penny, a parcel containing a sovereign need not be known from a sample of goods; and I can trust the Society of Arts for inventing light and strong boxes of various sizes for sending all sorts of lawful articles. In the next place we could separate to a great extent the letter post from the parcel post, so that a lost parcel would not be harder to trace than at present. Still, notwithstanding the inclination to favourable anticipations, it is not impossible that the present scandal, disorder, and expense may be increased. Now, it has struck me that a parcel post could be so constituted as not only adding to the public convenience, but as supplying the means by which the penny post might be relieved from the evils which the present partial and incidental transmission of parcels has entailed upon it. I should say, let us distinguish between letters and parcels. Let us say (for instance) that a parcel is a closed packet, not consisting of or containing paper only. The absence of other things, and especially coin, can be ascertained by perforating the letter, and even the seal, in suspected cases, with a very thin awl. Parcels (excepting bank notes in envelopes, posted as letters) would then be distinguished from things of no intrinsic value. What shall we do for their safe transit? Registration (which does not ensure absolute traceability) by giving and taking receipts is too cumbersome. But can we not adopt some system of check? The main use of registration consists in knowing the precise stage where the letter disappears. Few would attempt (and none could continue) to abstract parcels, if immunity from suspicion be narrowed to such a point. I think this might be accomplished by a more simple practice than that of registration. The officer who takes in parcels or unlocks the parcel box, might take and send an account of all parcels despatched, and the delivering office might keep a list of all parcels given out for delivery. It is unnecessary now to go more into detail. As this would add to the work, we must provide for the expense.

I find the tradesmen of this town would gladly give 6d. per pound to send parcels everywhere. It is said by your Committee that they can be profitably carried at 4d. per pound. Before this is decided upon, it should be remembered that the postage now paid on parcels will be lost to the Revenue. The report calculates on the Letter department paying as much as it does now. It will also be proper to ask whether, if a rural postman is overloaded with parcels, the rate of 4d. would pay for a supernumerary messenger? All that is now over his regular Post-office load, and not more than his strength, is profit to the Revenue. But is a halfpenny per pound (especially for a light load) enough to pay an extra messenger? Mind, I am not prepared to answer in the negative; I only raise the question. With town letter carriers, we should get a decided advantage over the present system. The letters would be delivered by one set of men, and the parcels by another. Letter-delivery in town suffers delay at present, from the packages with which the letter-carriers are loaded. A registered letter

too, is a very hindering thing. If letter-carriers had only common letters, they would get round their walks much quicker. The parcel carriers, with somewhat less speed, would take their parcels in light wheelbarrows, with covers that could be secured when left at the gate of a garden, in front of a terrace, &c. Then, again, with respect to the mail-cart service, those carts which carry London bags, might, in some cases, want two horses instead of one. But with cross-posts this would scarcely be the case in any instance, as they seldom carry heavy weights. I could exchange parcels with half this county, all the next, and part of another, without using the railway at all, and, I think, without any increase to the cart service.

Supposing, however, that the rate for transmission be fixed at 4d. per pound, I propose that 2d. be added to, and included in, the charge for each parcel, for the purpose of providing a check upon its exposure to loss. Let the charge be 3d. for the first quarter of a pound, and a penny for every additional quarter of a pound.

The following would give a simple and comprehensive table of the rates of inland postage:—

1. A closed packet or envelope, not containing nor consisting of paper only, 3d. for the first quarter of a pound, and 1d. more for every additional quarter of a pound, or fractional part of a quarter.

2. A closed packet or envelope, containing and consisting of paper only, if it does not weigh more than a quarter of a pound, may be sent for 2d., and if not more than half an ounce (I should prefer an ounce), it may be sent for 1d.

3. An open packet, containing paper only, may be sent at the rate of one penny for every quarter of a pound, or fractional part of a quarter of a pound it weighs.

It would be a very great thing if the Post-office robberies could be stopped. The advantages of the penny post are justly appreciated by the public, but I am often led to think that they are purchased at a high rate, when the number of artificial criminals which it has made is taken into account. I feel persuaded that the Society of Arts does not regard the conveniences of life as outweighing considerations of humanity, not to mention the credit of a public department, or the no inconsiderable amount of loss sustained by individuals of the general public. I am, &c.,

"A POSTMASTER."

DISINFECTION OF TOWNS, SEWAGE, AND SEWERS.

The following communication has been addressed by Dr. R. Angus Smith, F.R.S., to the editor of the *Practical Mechanics' Journal*, bearing upon the subject of his paper read before the Society last year:—*

I beg to send you a proposal by Mr. Alexander M'Dougall and myself, for the disinfection of the sewage matter of towns,—a subject to which public attention has lately been most strongly aroused by the arrival of hot weather. We deal, of course, with the chemical part of the question; and we know well that our plan produces complete disinfection, and not mere deodorization, which, however, is either total or partial disinfection. We propose to apply the disinfecting material by allowing it to flow into a pipe which shall intersect all, or the chief sewers at their highest part. The sewers will in this way be disinfected throughout, and the towns, of course, will receive the benefit. We have other modes of completely disinfecting the streets and courts, by putting some of the material used in the water carts, for example. The whole system will produce an amount of purity not before seen in towns. We have already given our plans, perhaps not so fully as may be required for

any one particular town, but in their general bearing, to the Town Council of Glasgow; and we understand that Mr. Bateman, the engineer, and Dr. Anderson the chemist, are requested to report upon them; but we have not been desired to give the gentlemen the results of our experience. This, however, will no doubt be arranged before a final report.

The proposals which have hitherto been made for dealing with sewage are chiefly of two kinds. The first removes the sewage as rapidly as possible on to the land in the vicinity of the town, and a system of manuring by irrigation is carried on without interruption through the year. The distribution of the sewage on the land is effected by various methods. The second operates upon the sewage after it has left the town, and converts the matters obtainable from it into a portable manure. Circumstances will determine where one or other of these processes may be adopted with advantage. We propose to deal with what is, in fact, the most urgent necessity of the case, and to add a provision to be adopted with either plan for preserving the air of towns from pollution by noxious emanations from putrid sewage. This we propose to accomplish by acting upon the sewage, so as to disinfect it in its passage through the town. Offensive effluvia from sewers have hitherto been dealt with mechanically; stench-traps and similar means of obviating the evil have been found imperfect and unsatisfactory in their result. They have proved to be an apparatus difficult to wield in sufficient force to make them a part of a perfect system. Our plan is to act upon the sewage as soon as it enters the sewers, by a continuous current of disinfecting material, so as both to remove its offensive smell and to arrest the further generation of noxious gases; the result will be that the atmosphere of the sewers themselves will be preserved in a state of comparative purity.

The substances we propose to apply are such as have been found to be efficient by extensive use, viz., sulphurous and carbolic or phenic acid. Hitherto we have used these substances in combination with lime and magnesia, and have found them remarkably efficient as a disinfecting powder—(Mr. M'Dougall's Disinfecting Powder).* In using them in cases where it is needful that a flow of water should receive no interruption, such as in a sewer, we do not propose to add the basis, or at least in very small quantity. The substances used are known to destroy noxious exhalations and to arrest decomposition. Our own experience with them has been so varied and extensive, that we have not the slightest doubt of their efficacy. We believe that science has not made known to us any other substances so well adapted for the purpose. The sanitary condition of towns is necessarily the first consideration—the economical application of the refuse, though secondary, is not unimportant; and on this ground also the materials we propose to use are the best that could be employed, as they preserve the substances to which they are applied unimpaired for the purpose of manure. In other words, the manure is kept pickled and ready for use, and after a long period is found to be undiminished in value. This follows from the fact that the decomposition of the sewage, and the exhalation of its valuable products, are prevented.

Those who advocate the precipitation of sewage and the manufacture of solid manure, will no doubt appreciate the advantages of this plan, as it delivers to them the sewage matter uninjured; and they will be able to obtain a much more favourable result than can be hoped for from sewage which has become putrescent, and consequently deteriorated.

The advocates of liquid manures will also appreciate the advantages resulting from this plan; they will obtain the manure in its fullest strength and in a scentless condition to apply to the land. Its use in irrigation will be

* See *Journal*, vol. v., p. 333.

* *Journal of the Society of Arts*, Vol. v., p. 333; *Practical Mechanics' Journal*, Vol. ix., p. 246.

as inoffensive as pure water, thus obviating one of the great objections to the system.

The greatest advantages of the plan we propose are to be found in the towns themselves, where disinfection will be almost universal, and, with reasonable care on the part of the inhabitants, putrescent sewage will be unknown. It certainly has been said by the advocates of the exclusive use of liquid manure, that when it is carried rapidly away it can give no offence, as it is put upon the land before it can be decomposed. It has not been our fortune to find manure so entirely free from odour, neither has our experience shown that it can be put upon land without giving offence, unless previously deodorised.

It is our opinion that 2lbs. of sulphurous acid and 1oz. of carbolic acid, will be sufficient to disinfect the excretions of 300 persons for one day. This will cost about a penny, and the cost for a city of 2½ millions of inhabitants will be about £12,675 per annum, or for every 100,000 inhabitants, £507.

The cost of the plant required at each station where the disinfectant is prepared, will be about £500. The services of a man and a boy will be sufficient; the number of stations required will depend much upon the contour of the site of the town, and will require the consideration of the engineer. The number for London will not be great, but the £12,675 includes the cost for the whole population. We believe that after the sewers have been thoroughly cleansed, a much smaller quantity than we have named will be sufficient for keeping them in a condition of comparative purity. It is ascertained that the disinfection is more easily accomplished when the forces are acted upon at a very early stage. It will be economical to manufacture the disinfectant near to the highest part of the sewers; these we propose to connect with the vessels in which the solution is prepared, the regulation of the quantity being under the control of the attendant. There are many particulars connected with the manufacture and use of the disinfectant which it is unnecessary to introduce here; they have been obtained by extensive experience, are simple and of easy application.

We believe the following advantages will arise from the method proposed:—

I. The purification of the sewers and disinfection of the town. This is a proposal entirely new in dealing with sewers. No one, as far as we know, has previously attempted the prevention of smell in the sewers themselves. It has indeed been asserted that the sewage can be removed from the town so rapidly, that there is no time to allow of decomposition. Granting the possibility: How rare is the fact!

II. This system can be applied where precipitation is used. The disinfected sewage passing through the town will be preserved without loss of manurial ingredients. It can be precipitated as readily as if it had not been disinfected, and the product obtained will be of greater value and increased in quantity by the amount of matter preserved, when an unexceptionable method of precipitation is arrived at. The inconvenience of leaving large accumulations of putrid matter outside the town will be removed, as there will be no fear of putrid exhalations from the mass, or from the liquid whilst it flows through the drains, even if they should be left uncovered.

III. This system can be applied where precipitation is not employed. The disinfected sewage may be allowed to pass through peopled districts and properties, where the passage of putrid sewage would be highly objectionable. Under this system it may flow without giving offence to any one, and may be used in irrigation with great advantage to the crops, and without in the slightest degree polluting the atmosphere. Experiments at Mr. Chamberlain's showed that liquid manure laid on the land caused a nuisance so great, that the neighbours resorted to legal proceedings for its removal; but when disinfected by the method proposed, no unpleasantness was perceptible.

IV. The expense of covered channels outside towns will be avoided. If, for example, the proposal of taking

the sewage through Essex were adopted, a covered channel would be rendered unnecessary by this means, although indispensable without disinfection.

V. In cases where the sewage is discharged into a river, it will prevent putrid emanations from the surface of the water. This would remove one of the most obvious causes of offence for sewage, and would apply to the Thames at London.

VI. The expense for all London will probably be under £18,000 per annum,—a sum which can only be considered as trifling in comparison to the advantages to be obtained.

Manchester, August, 1858.

SILKWORM.

M. F. E. Guérin-Mèneville has lately laid before the Academy of Sciences in Paris an account of a new Chinese silkworm, which he states is properly the *Bombyx Cynthia*, and which he distinguishes from the *Eria*, with which it has hitherto been confounded.* He says:—

"On the 5th of last July, I had the honour of presenting to the Academy some living butterflies of the new silkworm, which I had endeavoured, without success, to introduce into France last year, as well as some fertile eggs which they deposited. I now exhibit some caterpillars of this important silkworm, together with the first cocoons that I have obtained; and, with the permission of the Academy, I will read a short extract from a paper I have drawn up on the subject:—

"The result of my labours is that the silkworm of the *Aylanthus glandulosa* of Japan is the true *Bombyx Cynthis* of Drury (1773), represented for the first time by Dabenton the younger, in his coloured plates (1760 to 1765), and cultivated for ages past in China, where its silk forms the clothing of the whole population of some districts. Roxburgh (in 1804) believed that the *Eria* worm,† which is cultivated in the East Indies, belonged to the same species; and the confusion, which it has been impossible to set right for want of materials, has lasted up to the present time, so that everyone has called the *Bombyx Cynthia* the *Eria* worm, also named the *Arrindy-arris* in Hindostan, which is in reality a different species, and lives principally on the castor-oil plant, producing as many as seven generations in the year.

"From the experiments which I have made in the breeding of these worms, I am now able to point out differences in the caterpillars, in the cocoons, and in their habits, which enables me to distinguish them far better than can be done by the slight difference found in the moths, which would only have led observers to imagine they were simply local varieties of one and the same species. The products of those two worms are very nearly the same. The carded cocoons afford an excellent material from which, in China and Bengal, a very strong fabric is manufactured. 'In China,' says Father d'Incarnville, 'these silkworms of the ash (he had supposed the *Aylanthus* to be an ash) are a source of riches. The silk which they produce is of the colour of unbleached linen, lasts double the time of other silk, and does not easily spot.‡ The material is common in China, where it is known by a name which distinguishes it from the ordinary silk and from the other wild worms.' The Father d'Incarnville says:—'They make the *tsing-tsin* from that of caterpillars of the ash, &c.' In Hindostan,

* See Journal, Vol. ii., pp. 247, 263, 603, 835.

† Transactions of the Society of Arts, Vol. lii., p. 204—Ed. J. S. A.

‡ "Clothes made of this wild silk are not injured by rain, dirt, nor oil."—Stan. Julien, *Résumé des principaux travaux chinois*, &c., p. 174.

the thread which is obtained from the castor-oil silkworms is not less useful and common. 'The fabric which is made of it is of a loose texture and coarse, but it lasts an incredible length of time,' says Roxburgh, in conformity with Atkinson, and this assertion is confirmed by the most recent accounts.

"It is clear that the introduction of the true *Bombyx Cynthia* from China is now accomplished, and it only remains to develop this new industry, which is simply a question of money. All that is required is to raise plantations of the *Aylanthus*, a tree which is extremely easy of growth on the very worst soils, to cover them with the cocoons in the spring which have been hatched in the month of May, leave them to eat the leaves, protecting them only from birds, guarding them by some invalid workmen, incapable of any harder employment, as is done in China. At the end of June the first harvest will take place, followed immediately by a second in August. The cocoons required for stock will remain without hatching till the following May, which is not the case with the castor-oil silkworm, which continues breeding all the winter, requiring either the castor-oil plant cultivated in the greenhouse or the teasel.

"I shall consider myself well repaid for my exertions, if my labours shall result in the establishment of a new industry, which shall render the use of silk as common in this country as in China."

ELECTRIC TELEGRAPH.

Marshal Vaillant, Minister of War, lately addressed a letter to the French Academy of Sciences, requesting their advice whether the passing of the wires of the electric telegraph in the neighbourhood of powder magazines might not become a source of danger.

The question was referred by the Academy to a committee of the following gentlemen:—Messrs. Becquerel, Regnault, Despretz de Senarmont, Marshal Vaillant, and Pouillet as reporter.

The committee has just presented the following report, which has been unanimously adopted by the Academy:—

"It may be taken as certain that the electric currents passing through the wires for the ordinary despatch of messages can in no way be the cause of accidents; for, supposing that the wires became broken from any cause whilst a message was passing, the small sparks which would take place at the point of rupture would be insufficient to set fire to any powder which might happen to be deposited even on the wires themselves or the supports.

"It is, however, otherwise as regards atmospheric electricity. Its action is often formidable, and it would be an imminent cause of danger to the powder magazines.

"If, for example, the lightning should strike the wire, it is probable that it would be fused for a certain distance and dispersed, and that incandescent globules driven to a distance by the explosion, might be carried still further by the force of the wind; besides, the loose ends of the wire in a state of combustion, and driven by the same causes, would not fail to describe large curves round these points, and carry fire to great distances.

"If this be a probability, or simple possibility only, it is not the less necessary to place the powder magazines out of the reach of such a danger."

After having considered the different precautions to which recourse might be had, the committee gives the following directions:—

"1st. To use subterranean wires for that portion of the line which passes at a distance less than 100 metres from the magazines.

"2nd. To lay the subterranean pipes for the wires at such a distance that they will be in no danger from the employment of the workmen either in laying the line or in repairing it.

"3rd. To fix one or more lightning conductors on poles 15 or 20 metres high in the neighbourhood of the

subterranean pipes, so as to protect them throughout their whole length against any direct action of the lightning.

"We ask the Academy to approve of these regulations, which appear to us to afford sufficient security for the War Department without imposing too much on the telegraphs."

SOUTH KENSINGTON MUSEUM.

During the week ending 4th Sept., 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 3,875; on Monday and Tuesday (free evenings), 5,289. On the three Students' days (admission to the public 6d.), 595; one Students' evening, Wednesday, 123. Total, 9,882. From the opening of the Museum, 581,440.

Home Correspondence.

EXHIBITION OF 1861.

SIR,—The Exhibition of 1861 should comprise under one roof, but in separate rooms, first, the marvels of art, and secondly the productions of industry.

The success of the Paris Exhibition was a good deal marred by having separate buildings.

An early decision as to where and when the Exhibition should be is most desirable, for we are now drawing towards the autumn of 1858.

I am, &c.

PHILIP H. HOWARD.

EXHIBITION OF 1861.

SIR,—I am extremely sorry to find, from an extract in your *Journal* of Saturday last, that the idea of holding the proposed Exhibition of 1861 at Kensington Gore should be advocated in so respectable a journal as the *Builder*. The inconvenience of the site of the Great Exhibition of 1851 was only partially counterbalanced by the entire novelty of the undertaking, and I believe that those who saw and considered the amount of inconvenience and loss, in time and money, that accrued to the public, from the want both of railway and river, were astonished beyond measure that so many people should have reached the Great Exhibition, and would not have the slightest hope that any subsequent Exhibition could possibly pay under such a drawback.

It is to be regretted that the writer in the *Builder* has not given some reasons for his preference for Kensington over Battersea, instead of resting upon the assertion that the site belonging to the Commissioners is "specially marked out" for the purpose. It seems to me that a preference in favour of the Crystal Palace at Sydenham would be equally forcible.

The place "specially marked out" for the Exhibition of 1861 is that which can be most conveniently reached by the masses. Now Battersea has the triple advantage of road, rail, and river; it is becoming well known to the people, and it is desirable that it should be still more so. Again, a large building, which could, after the Exhibition had terminated, be applied to purposes of instruction and amusement, or even only the latter, would be an immense boon in that quarter of the town; and if the Exhibition of 1861 should yield such a result alone, it would be worth all the time and trouble bestowed upon it.

There can be little doubt, I think, that the managers of another Great Exhibition must of necessity pursue a different course to that followed in 1851. Success must be achieved, in 1861, by appealing to general and not special aid, by dependence more on judgment and less on enthusiasm, in short, by rendering the Exhibition more

popular in its management, and more in accordance with the habits and ideas of the public.

The Society of Arts has the means of obtaining valuable evidence upon the question of site, by sending a circular to the various Literary and Mechanics' Institutions in the neighbourhood of London, requesting each of them to take the subject into consideration, and to report the result, with reasons for the same, to the Society.

The Exhibition of 1851 was a marvellous success—marvellous in more senses than one,—but from the very nature of the difference between a first and second Great Exhibition, the former will be of service to the latter quite as much in the way of warning as of example. This in no way diminishes the honour which belongs to the managers of the former; they had a most difficult, almost impossible, task to perform, and they achieved an extraordinary success; but I believe that the same men, or any other set of men following in their footsteps, could not possibly succeed in repeating the experiment. The managers of the proposed Exhibition of 1861 must not calculate upon that sort of power which forces its way through rocks and over mountains, but upon that more valuable, but less imposing, faculty which teaches how to avoid them; and it seems to me that the first rock a-head is foreshadowed in the recommendation of the *Builder* as regards the site of the proposed Exhibition.

I am, &c.,

T. L. E.

MECHANICS' INSTITUTIONS.

SIR,—If Mechanics' Institutions are ever to accomplish the object for which they were designed, and prove the means of raising the moral and intellectual character of the people, they must receive a more general support from all classes of the community than it would seem has been accorded to them. It is true, that in many places there have been demonstrations of enthusiasm which appeared to leave no doubt of ample success, but unfortunately these ebullitions of popular feeling were too often of a spasmodic character, and from want of that continuous aid which can alone prove of real service, they failed in realising the anticipations which had been formed. On the other hand, it would be as well to guard against forming conclusions too hastily, and refraining from further efforts, because the first favourable promises have apparently been fruitless of results. It would be advisable also to bear in mind, that all the labour of conducting the affairs of an Institution should not be thrown too unsparingly on the willing few, but that each one should consider himself in some degree responsible for a success in which he has or ought to have an interest.

Amongst the topics which might advantageously be discussed on occasions of festive gatherings, to which I alluded in my last, not the least important is to show that all classes are directly concerned in the prosperous working of a Mechanics' Institution. To those who are of an age when knowledge can be best acquired, it ought not to be necessary to insist upon the incalculable advantages which they may gain by devoting their leisure hours to the improvement of their minds, of the many evils which they may thereby avoid, of the great and substantial rewards for their exertions which are placed within their reach, and the simple but expressive fact, that to the great majority there are no other means open to them by which so large an amount of good may be obtained. Though they may never rise out of the sphere in which they are moving, they will be wiser, better, and happier members within it, enjoying the self-consciousness of intelligence and that self-respect which ensures the respect of others.

There are many, however, to whom these arguments may not apply, and yet they are not exempt from the duty of supporting the Institution by their countenance

and subscriptions, because every one, whatever may be his rank in life, has an interest in the social welfare of the community of which he forms a part. Increasing intelligence is ever accompanied by increasing resources, which materially contribute to the well-being of a town and add to the means of enjoyment of all. To tradesmen, therefore, a flourishing Institution is a boon of no mean value; and if their own demands upon it be confined to the use of the library and attendance upon the lectures, they will receive full value for their subscriptions, besides inducing many a young man to grow up into a respectable and useful member of society. The wealthier classes should need no argument to elicit their sympathies and secure that assistance which is of so much consequence, as the amount of subscriptions required is in most cases too small to be any real object to them. By all classes, however, it should be remembered that there is no more effectual aid to the diminution of crime than a well ordered Mechanics' Institution. It removes many sources of temptation; to the idle it offers employment, to the ignorant it offers knowledge, and to aspiring youth a legitimate object of ambition.

Nor should such Institutions be without the cordial support of the ministers of religion, who can do so much by their influence if they have the will to exercise it. To whom can their exhortations to lead a new life be addressed with such a favourable prospect of receiving attention, as to the intelligent mind which has learnt to think in the Mechanics' Institution. If all that is desired could be accomplished, their ministrations would prove of far more effect than when, as is too often the case, the youthful mind, intent only on self-gratification, is insensible to the appeals which might have saved rash youth from many and irremediable follies.

Let me, therefore, once again press upon all the importance of active and sustained exertions to make Mechanics' Institutes throughout the country all that they ought to be. Much patience may have to be exercised before those for whom they are chiefly intended may be able to appreciate their advantages, but such an obstacle to their usefulness is the most convincing proof of their necessity. Hopeful perseverance will, however, be sure to be ultimately rewarded, and it is to this point that I would more earnestly direct the attention of those who feel discouraged by repeated failures. I could point to several instances where flourishing Institutions now bespeak the triumph of continually renewed efforts, and I firmly believe that in every English community there is too much latent good sense for such exertions to be wholly without fruits. This truth should be borne in mind not only by managers of existing Institutes, but in places where they do not exist, so that ere long there should be no town or village in Great Britain without such a means of improving its population.

The Society of Arts has lent much valuable assistance, but more use should be made of the columns of its *Journal* to encourage the timid, to strengthen the weak, to inform the ignorant, and, by the interchange of experience, to give value to isolated efforts. Local committees, when they feel themselves in difficulty, should make their wants known to their fellow-labourers in the cause; and when they find that their exertions have been crowned with success, should stimulate others to follow the good example, by making known what they have done. By such means have many of the great interests of the country been raised to their present state of prosperity, and by such means may many of the Mechanics' Institutions be placed on a more satisfactory footing. Those throughout the kingdom should do the same as those in this great county do by the Yorkshire Union. Availing themselves of its organisation, they seek, by unity of action and interchange of experience, to enjoy those advantages which singly, and unaided by mutual support, were unattainable. If, therefore, the *Journal of the Society of Arts* be made not only a record of the proceedings of Institutions, which is too often detailed too briefly, but a medium for cor-

respondence seeking and imparting information, stating difficulties, and assisting to remove them, it may prove a more valuable assistance than it has hitherto done to the labours of local managers. To do this, however, they must look to themselves; they must ask for information when they need it, and their own labours must supply the materials from which Mechanics' Institutions are to be benefited, and their advantages made intelligible to the whole community.

As a concluding hint, let me strongly recommend punctuality in correspondence. When returns are asked for to furnish statistical tables, they should be supplied promptly and surely, and the Secretary of the Society of Arts not be allowed to state, as he has done before, that having sent out above a thousand circulars, he has not received a hundred and fifty replies.

I am, &c.,

BARNETT BLAKE.

Leeds.

Proceedings of Institutions.

BARNESLEY.—In the last report of the Mechanics' Institute and Literary Society, the Committee note an improvement in the financial position of the Institute, notwithstanding a slight decrease in the income from members' subscriptions and donations. The list of members during the past year shows an increase of 15 persons; but, owing to the late financial troubles, some members have left the town, and the subscriptions of others may be withdrawn. The news-room continues to be well-attended, and there is no increase in the cost of that department. The news-room and library have been re-painted during the year, and a new book-case added for the library. The total number of volumes is now 1,490, of which 47 have been purchased, and 40 received from various donors during last year. The circulation of books and periodicals presents only a net increase of 32 volumes; but there is a remarkable and gratifying change in the quality of the works taken out, there being a decrease of 894 volumes of Novels, &c., 154 periodicals, and an increase of 1,145 volumes in reading of a more solid character. The most satisfactory feature in the present balance-sheet is, however, the hall and lecture account, which exhibits a cost of £11 4s. 10d., in 1857, against £41 17s. 10d., in 1856. This large difference arises chiefly from the increased lettings of the hall to the public. The lecture fees are £9 8s. 1d. in excess of the same item for the previous year, to which extent the purchasers of lecture season-tickets and members have been benefited in the quality of the lectures. The following lectures were delivered during the season:—Mr. George Grossmith, of London, "A Humorous Lecture on Lecturing;" Mr. Walter Rowton, of London, on "Comic Literature: an Evening with Charles Dickens;" Mr. Ellis Roberts, of London, harpist, by appointment, to his Royal Highness the Prince of Wales, "A Musical Lecture," with illustrations on the harp, assisted with the vocal services of Miss Annie Cox; Mr. George Dawson, on "The Improvers of Shakespeare: their Principles, Practices, and Failures;" the Rev. E. Higginson, of Wakefield, on "Good Reading;" Mr. William Kidd, of London, on "The Arctic Regions, an Hour's Entertainment for the Young," illustrated by dissolving views; Miss Clara Seyton, of London, "A Musical Lecture, illustrative of English Comedy and Ballad Opera;" the Rev. R. Balmgarnie, of Scarborough, on "Florence Nightingale;" Mr. Walter Montgomery, of Manchester, on "The Beauties of Shakespeare and other Poets." In addition to these, the members had free admission to two lectures on Palaeontology, for which they were indebted to gentlemen in the town, members, and others,

who privately subscribed the sum of £10 10s. for Mr. Hawkins's fees. To these gentlemen the thanks of the Committee are gratefully tendered. Another lecture on India, by the Rev. Canon Trevor, is also to be added to the list. The members of the Institute for the past year were as follows:—£1 annual subscribers, 6; 15s. ditto, 7; 10s. ditto, 201; 6s., ladies, 28; 6s., youths under 18, 30; 6s., country members, 11; total, 283.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Sept. 3, 1858.]

Dated 22nd April, 1858.

890. P. E. Aimont, Paris—Imp. in railway indicating and signalling apparatuses.

Dated 20th July, 1858.

1636. R. Clarke, Cwmbran, near Newport, Monmouthshire—Imp. in windows, window blinds, and shutters.

1642. W. Asquith and J. Asquith, Leeds—Ornamenting the surfaces of raised pile fabrics, and in the apparatus employed therein.

Dated 24th July, 1858.

1668. W. Merry, 9, Park-place-villas, Paddington—Imp. in apparatus for preventing the escape of foul air from area, kitchen, and scullery drains of dwelling-houses, also from street, stable, and slaughter-house drains.

Dated 5th August, 1858.

1776. J. Luis, 1b, Welbeck-street, Cavendish-square—A new system of trust. (A com.)

1780. W. Mosley, 17 and 18, New street, Covent-garden, and W. S. Champees, Clapham—An improved self-filling reservoir penholder.

1782. J. Henderson, Lasewade, Mid-Lothian, N.B.—Imp. in machinery for weaving plain or figured fabrics.

1784. C. Mather, Salford Iron Works, Manchester—Imp. in shearing machines.

1786. W. Clay, Liverpool—An improved mode of manufacturing cast steel and wrought iron into ingots and other forms.

1788. A. V. Newton, 66, Chancery-lane—Imp. in the manufacture of lace. (A com.)

Dated 6th August, 1858.

1792. F. H. Stubbs, Leeds—An improved mode of communicating between the guard and engineman on locomotives or railway trains.

1794. S. Carey, Clink-street Wharf, Bank-ide, Southwark—An improved system of forming the permanent way of railroad transit, also common tramway, and channel or watercourse, by the means of cast-iron plates or boxes peculiarly constructed, so as to make one continuous way or channel.

Dated 7th August, 1858.

1796. G. P. Lock, Liverpool—Imp. in the composition of paints for coating iron ships, and for other useful purposes.

1798. J. Webster, Birmingham—A new or improved metallic alloy.

1802. J. Inray, 66, Bridge-road, Lambeth—Imp. in apparatus used in printing.

1804. J. Walker, Glasgow—Imp. in machinery or apparatus for moulding or shaping metals.

1806. A. V. Newton, 66, Chancery-lane—Imp. in pianofortes. (A com.)

Dated 9th August, 1858.

1808. J. J. Murphy, Belfast—Imp. in the construction of floating bodies, and in the means of supporting floating structures.

1810. H. Clayton, Atlas Works, Upper Park-place, Dorset-square—Imp. in machinery for manufacturing bricks and tiles, and other articles of brick, earth, clay, or other plastic material.

1812. T. G. Messenger, High-street, Loughborough—Imp. in the manufacture of garden engines, which are also applicable to fire or other engines.

1814. W. E. Newton, 66, Chancery-lane—An improved method of arranging and applying magnets to counteract or compensate for the effects of local attraction on the mariner's compass. (A com.)

1816. W. Spence, 50, Chancery-lane—The precipitation of purple colouring matter by chloride of calcium. (A com.)

Dated 10th August, 1858.

1818. A. Barobou, 49, St. Augustin's-road, Camden-town—Imp. in the mode of fastening the soles and heels of boots and shoes. (A com.)

1822. M. Moses, Portdown-road, Malda-hill—Imp. applicable to umbrellas and parasol sticks.

1826. R. C. Gist, 36, Cannon-street—Imp. in knitting machines. (A com.)

1828. J. G. Appold, Wilson-street, Finsbury-square—Imp. in the manufacture of wire ropes or cables.

1830. E. Tamberlick, Rue du Commerce, Quartier Leopold, Brussels—Imp. in apparatus used for exhibiting advertisements. (A com.)

Dated 12th August, 1888.

1832. W. Knowles, Bolton-le-Moors, Lancashire—Imp. in certain parts of machinery used in preparing and spinning cotton and other fibrous materials.
1834. G. Houghton, Birmingham—An imp. or imps. in saddles.
1838. R. Baxendale, Manchester—Imp. in brushes, mops, or apparatus for washing and cleaning.
1840. R. Jobson, Wordsley, Staffordshire—Imp. in apparatus used when making moulds for casting shells and other articles.
1842. R. Jobson, Wordsley, Staffordshire—Imp. in apparatus for supplying water to axle-tree boxes and other journal bearings to lubricate the same.
1844. R. Jobson, Wordsley, Staffordshire—Imp. in apparatus for crushing and sifting.

Dated 18th August, 1888.

1846. L. Autra, Wardour-street—Improved apparatuses for exhibiting advertisements.
1848. C. L. Light, Pall mall East—Imp. in electric telegraph ropes or cables.
1850. J. Petrie, jun., Rochdale—Imp. in machinery or apparatus for stretching and drying woven fabrics.
1852. G. Schaub, Birmingham—Now or improved machinery to be used in the manufacture of certain kinds of printing types, and also in the manufacture of spaces and quadrats used in setting up printing types.

Dated 14th August, 1888.

1860. S. C. Lister and J. Warburton, Manningham, Yorkshire—Imp. in dyeing wool, hair, cotton, flax, and similar materials, also yarns and textile fabrics made from such materials, also in dyeing and tanning other substances and materials, also in washing wool, and in discharging the gum from silk.

Dated 16th August, 1888.

1865. G. K. Gayellin, London—Folding bedsteads, and which he calls the Universal and Folding Joint for bedsteads.
1866. P. E. Chappuis, 69, Fleet street—Imp. in stereoscopes and stereoscopic apparatus.
1867. C. G. Cutohey, 15, Portland-cottages, Forest Hill—A railway danger-signal-whistle.
1868. L. A. Herrmann and E. I. E. Herrmann, Paris—Imp. in connecting together pipes, tubes, or ways for the conveyance of water or other fluid, and in means or apparatus for regulating the flow or discharge, and supply of such fluids, and in means or apparatus for facilitating the forming of such connections.
1869. A. V. Newton, 66, Chancery-lane—Certain imp. in machinery for forging horse-shoes. (A com.)

Dated 17th August, 1888.

1871. J. Webster, Birmingham—A new or improved projectile.
1872. W. E. Evans, Norfolk street, Sheffield—Imp. in harmoniums, concertinas, organs, and other similar keyed instruments.
1873. J. Jackson and A. Fisher, Highfield Steel Works, Sheffield—An imp. in the manufacture of huts.
1874. G. Halkerton, Frenchie, Fife, N.B.—Imp. in mangles.
1875. J. Norton, Rosherville, Kent—Imp. in projectiles.
1876. F. Shaw, Siddals-road, Derby—Imp. in spindles for the spinning of silk and other fibrous material.
1877. G. Mills, 6, St. George's-terrace, Queen's-road, Regent's-park—Imp. in machinery for cutting wood for staves.
1878. D. Lichtenstadt, Surrey-square, Old Kent-road, and C. Duff, Hill-street, Peckham—Imp. in treating tan and tanning refuse to obtain valuable products therefrom. (A com.)

Dated 18th August, 1888.

1879. J. Luis, 18, Welbeck-street, Cavendish-square—A new safety system for preventing an accidental discharge in fire-arms. (A com.)
1881. W. Soelman, 3, Bennett-street, Middlesex—Additional imp. in the construction of propellers, chiefly with reference to my former patent, dated 20th August, 1885.
1882. T. Williams, Aberdaron, Carnarvon—An apparatus to be used for a churn or for a washing machine.
1883. B. Anderson, Black Braes, Stirling, N.B.—Imp. in stuffing boxes and packings.
1884. T. O. Duke, Kensington—Imp. in preparing cheques and such like documents, and in the means of preventing forgery or surreptitious alterations.

Dated 19th August, 1888.

1885. A. Pilbeam, 2, Lonsdale-place, Notting-hill—A bradawl screw.
1886. W. Hudson, Burnley, Lancashire, and C. Catlow, of Clithero, in the same county, for the invention of certain imp. in looms for weaving.
1887. W. F. Padwick, Hayling Island, Hants—A machine or implement to be employed on land sown with turnips, to protect them from the ravages of the fly, applicable also to the protection of other crops.
1888. J. C. Plomley, Maidstone—An imp. in joists and laths used for supporting hair and other pervious floors in coat-houses.
1889. M. F. J. Delfosse, Regent-street—Imp. in electro-magnetic machines.

1890. W. Smith, 18, Salisbury-street, Strand—Imp. in steam engines. (A com.)

Dated 20th August, 1888.

1891. W. Pearce, Bri-tol—Imp. in the manufacture of air-tight bottles, jars, or similar articles.
1892. W. A. Mann, Throwley House, near Faversham—An improved method of constructing railway carriages, whereby greater safety is insured in case of collision.
1893. F. Preston and W. McGregor, Manchester—Imp. in machinery for cutting files.
1894. H. Hood, Leeds Iron Works, Leeds—Imp. in the manufacture of railway tyre-bars, boiler plates, bar iron, and forgings.
1895. L. F. H. Drouin, Paris—Imp. in bearings and packings for rotating and reciprocating shafts, and joints of pipes, and other like purposes.
1896. P. Spence, Pendleton, Lancashire—Imp. in the manufacture of alum.
1897. J. L. Piggett, Missionary-place, Walworth—An improved construction of syringe or hand pump.
1898. W. Clay, Liverpool, and E. L. Bonzon, Sheffield—Imp. in the manufacture of iron and steel.
1899. T. Knowles, Gomersal, Yorkshire—Imp. in looms for weaving. (A com.)

Dated 21st August, 1888.

1901. F. F. Delpy, Paris—Imp. or imps. in metallic stay buses.
1905. W. Henson, Saint Just, France—Imp. in circular looms, or knitting frames.
1907. R. Laming, Hayward's Heath, Sussex—Imp. in purifying gas and liquids, in preparing purifying liquids, and in apparatus for apportioning measuring liquids.

Dated 23rd August, 1888.

1899. F. Puls, Roxburgh-terrace, Haverstock-hill—Imp. in the distillation of coal.
1911. M. R. Pilon, United States—Imp. in the manufacture and construction of fire arms, and in means of loading the same.
1913. L. Higgins, Jersey City, and A. Brown, New York, America—Imp. in reefing the sails of navigable vessels.
1915. T. Averill, Birmingham—An imp. or imps. in mills for grinding. (A com.)
1917. J. H. Robinson, Clement's-court—An improved skirt.
1919. A. Rotzmann, Lawrence-lane—Imp. in fastenings for bags, portemonnaies, pocket books, and similar articles. (A com.)

Dated 24th August, 1888.

1921. H. B. Barlow, Manchester—Imp. in self-acting lubricant. (A com.)
1923. H. Wilson, Watling-street—Imp. in the mounting of book saws.
1925. J. Biggs, Leicester—Imp. in the manufacture of caps, resembling in form the Turkish fez.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1971. M. A. F. Menons, 30, Rue de l'Ecliquier, Paris—Imp. in the supports of rails for railways. (A com.)—31st August, 1888.
1977. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the prevention of steam boiler explosions. (A com.)—31st August, 1888.

WEEKLY LIST OF PATENTS SEALED.

<i>September 1st.</i>		<i>September 3rd.</i>	
416. E. H. C. Monckton.	472. W. Clark.	1507. W. Pearson.	
418. G. and J. Kirkley.	514. J. Jameson.		
423. W. H. Graveley.	570. J. M. May.		
426. G. A. Biddell.	590. W. H. Morrison.		
434. P. Moore.	1048. J. West.		
399. H. G. Collins.	1112. H. Walker.		
446. C. F. Parsons.	1268. E. Atwater.		
447. C. R. Moate.			
451. J. S. Nibbs and J. Hinks.	484. W. Harding.		
452. Comte C. Cavalli de St. Germain.	485. G. S. Andrews.		
455. E. Burke.	496. F. E. D. Huet.		
464. J. H. M. Malsait.	497. J. Worrall and C. Ross.		
467. T. Lyne.	499. J. Warburton.		
	508. J. T. Coupler.		

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

<i>August 31st.</i>		<i>September 3rd.</i>	
1975. F. C. Calvert.	1986. C. and J. Clark.		
	1998. W. H. James.		
1988. W. H. Zahn.	1999. T. T. Coniam.		
2009. G. Collier.	2011. J. H. Giamford.		

ERRATUM.—In last week's *Journal*, for "2032. R. B. Feather," read "2332. F. C. Lepay."

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4116	August 30.	Improved Braces.....	G. Barnes.....	9, New-court, Goswell-street. Grove Villa, Compston, near Fy-mouth.
4117	" 30.	Church Hassock.....	A. Browne.....	

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 17, 1858.

NOTICE TO INSTITUTIONS.

The Prizes and Certificates awarded at the Examinations held in May last, have been forwarded to the several Local Boards for distribution.

Copies of the Programme of Examinations for 1859 may be obtained on application to the Secretary of the Society of Arts.

COAL IN THE SOUTH-EASTERN PARTS OF ENGLAND.

The following is an abstract of a lecture delivered at the Royal Institution by Mr. R. Godwin-Austen, F.R.S. and G.S. :—

Fossil fuel may be of any geological age: seams and traces of it have often encouraged researches amongst the tertiary strata of the London basin; even within the last few years there has been a Woking Heath coal-mining adventure; and it has long been a matter of popular belief that Blackheath is to supply London with coal. There are, however, thick accumulations of tertiary fuel, of which Bovey, in South Devon, is the best example in this country. There is coal belonging to the period of the chalk—there have been innumerable trials for coal amongst the fresh-water formations of the Weald of Kent, Surrey, and Sussex—there is tolerable coal associated with the oolitic series of Yorkshire; but the coal to which the following speculations refer is that which is derived from what have been designated the “true coal measures.”

The period to which this coal belongs in the earth's history is of very great antiquity; but the usual way of representing its age by reference to a vertical scale of geological formations, is inapplicable in the present case; and the only way in which it can be stated is this, that the whole series of formations which may be seen in the cliffs of the south coast of England, from Torbay to the Isle of Wight, have been accumulated since the period of the “true coal” series.

The superficial extent of the carboniferous series in this country is very great; allowing for what has been denuded, and what we know is covered up, it may be described as extending in a broad band from Berwick diagonally across the whole island into South Wales, and thence across the county of Devon.

The usual subdivision of the great carboniferous series into a descending series of “coal measures,” “mountain limestone,” and red sandstone, is geographical; the area of sandstone with coal plants is western; that of the limestone is central; and true coal measures occur unconnected with either. The carboniferous formation, as a whole, exceeds that of any other geological group in this country, considered with reference to surface.

What is coal? It is pure vegetable matter—the product of plant-growths. And with respect to the mode by which it has been accumulated, two theories have been proposed; there is the “drift” theory, which accounts for its occurrence as the accumulations of vegetable matter, brought down by mighty rivers, and deposited in lakes and sea-margins. There is something too turbulent in this theory to account for our great seams of fossil fuel.

The other theory is, that coal is the product of a vegetation which grew upon the very spots, and covered the

areas over which our coal-beds extend, like the peat-beds of the present day. This is the theory of M. De Luc, M. Ad. Brongniart, and Messrs. Lindley and Hutton.

In supposing that coal originated as peat, all that is meant is, that it is the product of a vegetation composed of like plants, such as could live on in association over the same spots, growing above and decaying beneath; but differing as widely in the plants which composed it from our present peat plants, as did the whole of the vegetation of that period from that of the present period; the huge stigmaries are wholly unlike any plants which commence the peat growth now.

The succession of a coal-field may be seen in a small scale in the deposits of lakes which have had differences of level from local accidents; and with reference to extent Ireland may be taken as an illustration of continuous masses of vegetable matter, of vast thickness, covering the whole country for 50 miles, and at low levels. Depress Ireland ever so little, so that the waters of the sea should reach in some places, and the river waters, such as those of the Shannon, should collect into lakes; and just in proportion as the water was shallow would an uniform stratum of sand, or silt, or gravel, be spread out above the peat-growths.

The history of the coal-fields of this and every country, is that of an endless succession of such changes.

The question of the probable existence of coal measures at any given spot over the European area depends primarily on the original form of the surface of these coal growths; in other words, can we construct a map of Western Europe for the coal measure period?

The restoration of the physical features of a portion of the earth, for any given past period, is not so difficult, nor so purely speculative as some may imagine; every form and combination of mineral materials composing the sedimentary formations, all the forms of life they contain, serve to indicate the precise conditions under which they have been accumulated. Shingle and gravel mark marginal zones, and zones mark lower or sub-marginal regions, deep sea deposits consist of mud or ooze; thousands of persons who have never even heard of the inquiries of the geologist, have doubtless argued that Blackheath, with its rounded shingle, must at some time or other have been at the sea-side. Assemblages of marine shells are the evidences of former seas; land and fresh-water shells and plants of old lakes and terrestrial conditions.

By the aid of such guides as these, the form of the area of the coal measures may be defined. Commencing in the west, we have early indications of the proximity of dry land and fresh-water accumulations. The earliest carboniferous deposits contain fern-like plants in wonderful profusion and beauty, with them are “pond muscles” (*anodon*). The land here lay to the south. The deposits of the North of Ireland require the existence of a wide expanse of dry land somewhere beyond it on the north. The Wicklow mountains were part of the dry land of the coal period. In the beds of the carboniferous limestone near Dublin may be seen angular fragments of the peculiar granite of these mountains, and which must have been floated away by seaweeds from a shore line, just as happens now. Dry land connected the Wicklow mountains with those of Wales. If we pass over this interval, we find evidence that the mountains of Wales were then dry land. The conditions of portions of the coal-measures bordering on this region have been investigated by most competent geologists, Sir R. Murchison and Mr. Prestwich. In the Shrewsbury district are pure fresh-water limestones. Coalbrookdale, throughout the whole accumulation of its beds, seems to have been immediately subordinate to an area of dry land. The great Yorkshire coal series, which has been so well described by Professor Phillips, is wholly lacustrine, with the exception of one intercalated band of marine limestone.

The proximity of dry land to the Edinburgh coal-field

has been shown by the researches of Dr. Hilbert and Mr. L. Horner, in the fresh-water deposits of Burdie. The mountains of Cumberland were dry land, and so all those of the border counties which range from Wigtownshire to Berwick. All the mountains of the western highlands of Scotland, an area extending north beyond the Shetlands, and westwards into the Atlantic, was also land surface: a vast tract lay in this (the north) direction, of which the great Scandinavian chain alone remains, and which supported the rivers which bore down the waste of granitic and crystalline rocks which enter so largely into the coal-measure sandstones of our northern districts.

Passing across into the Cotentin, we find a series of coal formations, skirting the old mountain ranges of the north-west of France.

The great central granitic plateau of France is fringed with coal growths, and over the whole of its surface are innumerable small coal fields, the lacustrine accumulations of the valleys of that region—this was an upland coal region.

The Vosges mountains have been raised over a surface which was dry land, and was connected with the Schwarzwald, the Odenwald, and the Spessart, and a great tract extending north and east, whence came down that curious assemblage of terrestrial forms which has been met with in the great fluvial and lacustrine deposits of the Saarbruch coal basin. Such is the form of the area which contains the great coal formations of western Europe.

The island which is represented in the interior of that great basin is not imaginary*; there is evidence of direction and extent of southern coast line from the shingle bed of Burnot. The extension of a band of shingle from beyond Eupen to the Boulonnais, marks the direction of an old coast line which lay to the north of it. It was from this mass of land that the terrestrial vegetation, and the fresh-water shells, so abundant in the Liege coal measures, were derived.

The whole area, as here described, may be compared, as to its physical characters, with large level tracts which lie west of the Blue Mountains in Australia, into which the Lachlan, the Darling, the Murrumbidgee, and the Murray discharge.

Between the close of the coal growths and the period of the formation which next succeeded, the surface of the whole of the area which has been sketched out was disturbed and broken up. Some of the lines, like that of our Pennine Chain, conform to those masses of terrestrial surface which tended in that direction; and a very remarkable line is one which has a general east and west direction across the European area. This line also conforms to the direction of old land which was to the north and south of it, and comprises the whole of the interval between the coal-growth surfaces of the Saarbruch districts and those of Belgium.

The section along the Meuse affords good illustrations of the character of this band of disturbed strata; in this section the upper beds of the coal measures occupy the deep troughs; the older parts of the Palaeozoic series appear in the ridges. Such is the character of the great Liege, Namur, Mons, Valenciennes coal band throughout.

The line which passes along the south of this coal-band was a boundary for the oolite formations, and for the earliest accumulations of the cretaceous period. This is particularly well seen in the Boulonnais.

The question as to the probability of coal in this (south-east) part of England, depends on the relation between the physical configuration of the present surface as compared with this older surface.

The character of the axis or ridge of Artois, with its valleys of elevation, was described as a continuation of the line of disturbance along the south of the Mons

coal band on the east, and as coinciding with the north escarpment of the Boulonnais on the west. The Boulonnais is physically a portion of the great elliptical denudation of Weald, of which the North Downs from Dover, west, are a continuation of the chalk range from Weissant, east. This line of disturbance is continued on by the valleys of elevation of High-clere, King's-clere, &c., and opens out into the valley of Devizes, forming a great linear anticlinal ridge, which coincides with the axis of old red sandstone of Frome, supporting the coal-fields of Somerset on the north.

The principle on which the existence of a band of coal-measures may be conjecturally placed along the south-east counties of England is this,—that like physical features have a like significance; the precise probability of the continuity of the coal band along our south-east area is great, and every fresh point of agreement adds strength to that probability; so that when these amount to three or four, the evidence may be deemed conclusive.

The Kentish-town artesian well passed through the white chalk and gault, a shingle band of old sedimentary and crystalline rocks, ending on micaceous sandstones, at a high angle. Here the points of agreement with the French and Belgic sections were, 1st, the absence of the oolite series; 2nd, of the lower cretaceous strata; and 3rd, the occurrence of the tourtia or shingle band, as in Flanders and the north of France.

The artesian well at Harwich found the chalk resting in old clay slate, with cleavage structure, and micaceous sandstones; and, from the presence of a *Posidonia*, may be referred to the culm series of the Rhenish provinces or of Devonshire; in this instance there is a perfect agreement with the condition of surfaces which extend north from the Belgian coal band.

By the help of these points, we can trace the arrangement of the old rocks beneath our south-east counties. The limiting boundary of the oolitic series, and of the lower green sand, lies south of London. The coal-trough conforms to the valley of the Thames and Kennet; older rocks still, such as those of the Belgian series, rise to the north; beyond which, at the distance of Harwich, the coal series is again brought in.

The existence of coal beneath Blackheath is therefore not so great an improbability as was once supposed; and in the absence of the whole series of secondary formations, from the white chalk downwards, is its depth probably very great.

ARSENIC IN PAPERHANGINGS.

The following letter, addressed to the editor of the *Daily News*, and published in that paper on the 13th inst., has been forwarded to the editor of the *Society's Journal* by Dr. Halley:—

SIR,—In your number for the 1st of the present month, which I have only just had an opportunity of perusing, there is a leading article on the above subject, in which allusion is made to a statement of mine, the validity of which you assert to have been controverted by the experiments and opinion of Mr. Phillips, the chemist to the Board of Inland Revenue. May I crave the indulgence of your space whilst I correct a misconception into which that gentleman has fallen, and at the same time vindicate the correctness of my own assertion.

The only communication that I have yet made upon this subject was that contained in a letter to the *Times* of the 11th January last, a letter hastily written on the spur of the moment, in reply to one by Mr. Fletcher, purposely condensed as much as possible, but containing a plain statement of facts as they occurred, with the simple view of warning others, and, if possible, to prevent the suffering I had myself undergone.

* The reference here made is to a map which represented the physical features of Western Europe, at the period of the coal growth.

This letter was copied nearly entire into the number of the *Pharmaceutical Journal* for February last.

In the number of the *Journal of the Society of Arts* for the 27th August last, at page 606, Mr. Phillips, taking the report in the *Pharmaceutical Journal*, entirely misconceives, or at any rate misquotes, my statement, for he says: "It is stated that Dr. Halley, of Harley-street, had detected arsenious acid in the atmosphere of his study, the walls of which were covered with green paper, and that the test he employed was 'sheets of paper soaked in a solution of ammonio-nitrate of silver,' and that upon this paper were deposited numerous well-defined crystals of arsenious acid." This is not what I stated, and I am surprised that any chemist should place such a misconception upon the words I used. The merest tyro in chemistry should be perfectly aware that arsenious acid could not be so deposited. What I did state was this: "The air of the room was next carefully tested (by means of sheets of paper soaked in a solution of the ammonio-nitrate of silver, a very delicate test of arsenic), and distinct crystals of arsenious acid, visible under a low power with the microscope, and sufficiently well defined and numerous to preclude the possibility of mistake, were obtained on two repeated and separate occasions." In writing to a non-professional journal I did not enter into every step of an analysis of a purely chemical nature, but gave the results of the experiment, merely indicating between brackets the key to the means used, that any chemist curious in the matter might repeat the experiment, filling up, of course, the blanks left in the description of the process. The obtaining of arsenious acid crystals was a positive and conclusive result—the fact—terminating the whole experiment, the commencement of which was the suspension in my room of sheets of paper soaked in the solution of ammonio-nitrate of silver, which in their turn were submitted to reduction, and so on to the result, the process being that known as Reinach's test.

But Mr. Phillips questions the fact of the crystals obtained being really those of arsenious acid; on the contrary, asserting that they were "more than probably" those of nitrate of silver. Without laying claim to any great knowledge of crystallography, which you assert is my presumption, it requires no great amount of acumen to distinguish between the decided octahedra of arsenious acid and the tabular plates of nitrate of silver, not to mention the impossibility of the resulting crystals in the experiment described being those of the latter substance.

Again, Mr. Phillips has misquoted my opinion as to the mode in which the arsenic is given off from the paper. I have not asserted, nor do I believe, that the arsenic contaminates the air in the form of arsenious acid. This is a very difficult point to determine, requiring more time and attention than I have had to spare from my professional avocations; but that, under certain circumstances, arsenic does contaminate the air of rooms covered with those papers to a most deleterious extent I firmly re-assert; and shall be most happy—I won't say to convince, but—to show Mr. Phillips or any other chemist interested in the point the results of the experiments alluded to, upon which this opinion is founded.

And now, sir, in regard to the counter-experiments of Mr. Phillips and others, I am not prepared to explain in what manner, in every instance, they have failed to obtain similar results. It is not easy from mere description to judge of an experiment involving minutiae of manipulation; but knowing the quantities experimented with, and the very minute results I obtained—knowing also that those results would have been overlooked but for the use of the microscope, which Mr. Phillips, in common with many of his school, seems to disparage—I confess that his experiments, although, I have no doubt ably and apparently impartially conducted, have in no way shaken my confidence in those alluded to in my letter, conducted as they were with the kind and able assistance of Mr. Williams, of New Cavendish-street, a gentleman

whose extensive experience as a wholesale manipulator is well known. The tests used were all prepared by him, and he kindly undertook many of the minutiae of the analysis. It is however but fair to state that in several similar experiments I failed to obtain similar results—showing that it is not all arsenically coloured papers that give off the poison, and this may explain why some persons have not suffered from inhabiting rooms so papered; but, on the other hand, I re-assert, for I know from personal experience and from numerous instances to my own knowledge well authenticated, that many persons have suffered from this cause.

Apologising for the unavoidable length of this communication, I am, &c.,

ALEXANDER HALLEY, M.D.

7, Harley-street, Sept. 11, 1858.

The following is the passage in the article from the *Daily News* of the 1st inst., referred to above:—

The old proverb, that a "little knowledge is a dangerous thing," if not to its possessor at least to others, has been well exemplified by some recent chemical investigations. The progress of chemistry of late years has been so rapid that its most enthusiastic students have had hard work to keep pace with its advance. It has accomplished such marvels, and shown such usefulness in improving the manufacture of so many of the conveniences and even necessities of every-day life, that we have all learnt to treat the opinion of the chemist at least with respect, if not with something approaching the most profound deference.

If the chemist is to retain that position, he can only secure it by the name not being usurped by those who really have no title to it. Those who do assume a knowledge of the science must also be careful not to step beyond the legitimate conclusions of their analysis, or substitute imagination or presumptuous assertion for demonstration.

In the evidence given by Dr. Alfred Swaine Taylor before the Committee of the House of Lords, on the "Sale of Poisons Bill," he alarmed their Lordships by describing the injurious effects of paper-hangings coloured with the arsenite of copper. Knowing the reputation of Dr. Taylor as a chemist, we have felt very uncomfortable since when sitting in any room covered with pretty green paper—especially if a gas-light has been burning. Our terror seems to have been partly shared by the Commissioners of the Inland Revenue Department. Their new offices had been hung with the poisonous paper, chosen no doubt for its refreshing colour. Instead of at once tearing down the obnoxious paper, they proceeded according to the customary rule of routine; their attention having been called to the circumstance they directed Mr. Phillips, the Chemist to the Board, to investigate the subject, and report.

The devotedness of the Commissioners is most admirable. We can fancy the conscious sense of martyrdom with which they sat environed with supposed arsenical atmosphere, while their chemist was preparing his Report. We knew not that we possessed a Board who would sacrifice their own health, rather than put the taxpayers to the expense of re-papering their offices. We congratulate them on the result of their officer's Report, and that they have now the pleasing assurance that their devotion has not filled their bones and livers with arsenic, to be produced by Professor Taylor, on some future *post-mortem*, for the edification of a coroner and his jury.

Mr. Phillips set about the investigation in a very proper and sensible manner. Two small closets were papered with the suspected covering. No ventilation was allowed, save that admitted round the chinks of the doors. The air was thus necessarily longer in contact with the paper than it would have been in an ordinary room. Both closets were carefully closed for 72 hours,

and in one a gaslight was kept burning 45 hours. The most delicate re-agents for testing the atmosphere of the closets were used without detecting the slightest trace of arsenic. It may be asked, then, how did these papers acquire so bad a name?

Last February a physician communicated to the *Pharmaceutical Journal* that he had detected arsenious acid in the atmosphere of his study, the walls of which were covered with green paper. The test he made use of for determining this fact was the hanging in his room "sheets of paper soaked in a solution of ammonia and nitrate of silver." After a time he found the paper covered with numerous well-defined crystals of arsenious acid, visible under a low power with the microscope. Mr. Phillips hung paper similarly prepared in his experimental closets. His paper was covered with crystals, but analysis proved these crystals to be composed of nitrate of silver, derived from the solution in which it had been dipped. Mr. Phillips therefore assumes, and we think with perfect justice, that if the learned Physician had trusted less to his presumed knowledge of crystallography, and tested his crystals, instead of jumping at the conclusion that they were composed of arsenic, he would have found them nothing more than nitrate of silver.

It may be some consolation for those of our readers who inhabit rooms papered with pretty green patterns, to learn that Mr. Phillips and his family have occupied a sitting-room covered with a paper heavily laden with arsenite of copper, for three years, without experiencing the slightest ill effect, though his bed-room during the whole time was papered with arsenical hangings. This is not, however, the principal reason why we have noticed Mr. Phillips's admirable Report. It is, we conceive, of the greatest importance that the public should be put on their guard against the too easy reception of assumed chemical conclusions.

We have no doubt of the perfect good faith of the physician who called the attention of the public to his presumed discovery. He did so from a praiseworthy motive. But we hope the exposure of his defective analysis will caution others from intruding their imperfect determinations on the public, to the serious detriment, it may be, of their honest neighbours.

The following letter, in reply to Dr. Halley, appears in the same journal for the 14th inst. :—

To the Editor of the *Daily News*.

SIR,—Dr. Halley has endeavoured to show, that in your leading article on the hasty conclusions formed by some chemists you have done him an injustice. He believes that you have been misled by the report of Mr. Phillips, the chemist to the Board of Inland Revenue.

Now, sir, I do not believe that you have been misled in the slightest particular, or done any injustice to Dr. Halley. What are his own statements in defence of his analysis? He says that he tested the air of the room covered with arsenical dyed paper by means of sheets of paper soaked in a solution of the ammonio-nitrate of silver, that these sheets of paper, after exposure, were reduced, submitted to a test known by the name of reinsch, and that by this means he obtained crystals sufficiently large to be seen under a low power of the microscope.

Because these crystals were decided octahedra, he maintained that they were crystals of arsenious acid. You, sir, complain, and so do I, that because Dr. Halley saw crystals of the form assumed by arsenious acid under certain circumstances, he jumped at the conclusion that the form of the crystal was a sufficient evidence to identify the substance. Now, sir, I have devoted a little attention to the subject of crystallography, and I therefore know that there are a vast number of substances besides arsenious acid which will crystallise as regular octahedrons. Dr. Halley had paper soaked in a combination of ammonia, silver, and nitric acid. He submits

this paper, after its exposure to an atmosphere contaminated by gas, to certain tests. The paper had therefore, in all probability, absorbed the element sulphur, either in a simple state or combined with certain gases. Can Dr. Halley, therefore, take upon himself to assert, that the octahedral crystals could not have been formed from certain chemical combinations made during his experiments, which may not have contained a single particle of arsenic or arsenious acid? Is he sure that these octahedra were not crystals of sal ammoniac?

His sheets of test paper contained ammonia, the paper itself was probably not free from the chlorine it had absorbed in its manufacture. Is it not therefore as probable that the crystals he saw under his microscope were a combination of chlorine and ammonia, which will assume the form of a perfect octahedron, as that they were formed from a combination of arsenic and oxygen derived from the atmosphere? Which is more probable? That the crystals were formed from the combination of substances existing in the paper, or from the combination of substances supposed to be derived from the atmosphere. But taking into consideration the known impurities of the atmosphere, these might have combined with some of the ingredients contained in it introduced into the paper, so as to form combinations known to crystallise in the form of the regular octahedron.

For any evidence Dr. Halley has given us to the contrary, he may have actually produced diamonds without being aware of his valuable discovery. Both his paper and the atmosphere contained carbon. The diamond, as pure carbon, assumes frequently the form of the perfect octahedron, in its crystals. If form be a certain test as to chemical composition, what evidence had Dr. Halley adduced that his so-called crystals of arsenious acid may not have been microscopic diamonds?

Dr. Halley admits that he was satisfied that because he saw crystals which he assumed to be perfect octahedra, these crystals were necessarily composed of arsenious acid, because he suspected the presence of arsenic in the atmosphere. It is of his rash conclusion that Mr. Phillips complains. He examines the atmosphere of a room far more likely to be impregnated with arsenic than that examined by Dr. Halley, without discovering the slightest trace of that deleterious substance. Mr. Phillips is chemist, Dr. Halley a microscopist. Dr. Halley gets a friend to manipulate the chemical part of his tests for him. Trusting to the deceptive form of his crystals, he neglects to submit these crystals to any test but their form. That form belongs to a host of substances besides arsenious acid; therefore Dr. Halley's ambiguous result cannot be taken as any confutation of Mr. Phillips's analysis.

Dr. Halley wrote his account of his experiments vaguely as to lead Mr. Phillips to infer, as one reasonably might have done, that the microscopical crystals were deposited on the surface of the test papers. Mr. Phillips found his paper covered with crystals of nitrate of silver; he, therefore, hazarded the opinion that Dr. Halley's crystals, if tested, would probably have been found to be simply nitrate of silver. To this Dr. Halley replies, that it requires no great amount of acumen to distinguish between the decided octahedra of arsenious acid, and the tabular plates of nitrate of silver. If Dr. Halley will consult Phillips's translation of the *Pharmacopecticon* which I have no doubt he possesses, he will see there that the author of that work states that the octahedral faces of crystals of the nitrate of silver sometimes are enlarged as nearly to obliterate the rhombic faces. It would require a very delicate eye to distinguish the octahedra of nitrate of silver, with their upper and lower angles replaced by a plane, from the regular octahedra of arsenious acid, with their upper and lower angles replaced, as they frequently are, by planes of the cube.

Without actual goniometrical measurement, it is extremely difficult to distinguish the regular octahedra

rom some of the octahedra of both the square prismatic and the rhombic systems.

I would recommend Dr. Halley to repeat his experiments, and when he has obtained his octahedra, to submit them to such chemical tests as may satisfactorily determine their substance. Till he does so, he has no answer to Mr. Phillips's tests, nor will his negative crysalline evidence satisfy a

CRYSTALLOGRAPHER.

THE BAROMETER.

In the First Report of the Committee of the House of Commons on Shipwrecks (1843), will be found the evidence of Captain (now Admiral) Fitzroy, suggesting the importance of the barometer, not only on board ship, but on land on the coasts, as a guide for men having the charge of ships and fishing vessels. Admiral Fitzroy says:—

"I think that a neglect of the use of the barometer has led to the loss of many ships. From a want of attention to the barometer, they have either closed the land (if at sea), or have put to sea (being in harbour in safety) at improper times, and in consequence of such want of precaution the ships have been lost, owing to bad weather coming on suddenly, which might have been avoided had proper attention been paid to that very simple instrument. While alluding to the use of barometers, I may remark, that if such weather-glasses were put in charge of the Coast guard at the principal stations round the coast, so placed as to allow any one passing by to look at them, they might be the means, not only of preventing ships from going to sea just before bad weather was coming on, but of preventing the great losses of life which take place every year on our coasts (particularly in the Orkney Islands and on the coasts of Scotland and Ireland), owing to fishing vessels and boats going to sea when bad weather is impending. No bad weather ever comes on our coasts without timely warning being given by the barometer. The oldest seamen are often deceived by the look of the weather, but there is no instance on record of very bad weather, such as would have involved loss of life to the extent we have heard of in several years, having come on without the barometer having given timely warning. By the very small expense of an establishment of barometers, so placed as to be accessible to any fishermen, boatmen, or others on the coasts, much loss of life, as well as loss of boats, and even shipping, might be prevented.

"What state of the barometer indicates danger? It varies in different climates according to the range. The range is small between the tropics, but very large in the higher latitudes. In our climate the range is usually about two inches. The barometer falling considerably below its average height is at once an indication that some considerable change is going to take place, and when it falls low, as for instance (in our climate) to near 29 inches, or below 29 inches, a gale is certain to follow.

"Are the Committee to understand that you are of opinion that every ship ought to have a barometer on board?—I think that every ship ought to have either a barometer or sympiesometer, which is an efficient substitute for a barometer.

"Does the barometer show a sudden change of wind as well as the coming on of bad weather? Supposing a gale of wind is blowing, and you are sailing with a fair wind, does the barometer show any change of wind?—Decidedly.

"Supposing the wind was at west-north-west, and it shifted suddenly to west-south-west, would the barometer indicate that?—It requires some practice to be able to say exactly what is likely to take place after a change in the barometer; but the principal point for a seaman is, that no violent wind will blow without the barometer giving warning. He may not know exactly from what

quarter the wind will come, but no strong wind will come on without warning being given.

"You recommend that at the Coast-guard stations there should be a barometer, by means of which people would know when a violent wind was coming on; but as it would not indicate the quarter from which it was coming, would you have the merchant ship always remain in port till the barometer showed fine weather?—Being accustomed to the barometer on our coast, one could tell from what quarter the wind would probably come by the height of the barometer, taken in connexion with its previous height, and the state of the weather, and the strength of winds that had prevailed before. Taking the state of the barometer in connexion with the appearance of the weather one could make a satisfactory conclusion as to the quarter from which any violent wind would come. And the barometer, after very little practice, can be used by any man. There is no difficulty in using it sufficiently to know that danger is coming on; and if danger is coming on, a man refrains, of course from exposing himself to it; the quarter from which the wind comes being of minor consequence.

"With a north-easterly wind, in this part of the world, the barometer stands, on an average, about half-an-inch higher than with the same strength of wind from the south-westward. All over the world there is a similar difference proportionate to the range of the mercury, for which allowance should always be made in considering the height of the barometer."

In the first number of the Meteorological Papers, published by the Board of Trade, 1857, is the following passage respecting the use of weather-glasses:—

"The variety of interesting and useful, if not always important, subjects included within the range of meteorology, is not perhaps sufficiently realised in the minds of active participants in the world's stirring work. Irrespective of any scientific object, how much utility is there to all classes in what is commonly called 'weather wisdom?' In our variable climate, with a maritime population, numbers of small vessels, and especially fishing boats, how much life and property is risked unnecessarily by every unforeseen storm? Even animals, birds, and insects have a presaging instinct, perhaps a bodily feeling, that warns them; but man often neglects his perceptive and reasoning powers; neither himself observes, nor attends to the observations of others, unless special inclination or circumstances stimulate attention to the subject. Agriculturists, it is true, use weather glasses; the sportsman knows their value for indicating a good or bad scenting day; but the coasting vessel puts to sea, the Shetland fisherman casts his nets, without the benefit of such a monitor, and perhaps without the weather wisdom which only a few possess, and cannot transfer to others.

"Difficult as it is to foretell weather accurately, much useful foresight may be acquired by combining the indications of instruments (such as the barometer, thermometer, and hygrometer) with atmospheric appearances. What is more varying than the aspect of the sky? Colour, tint of clouds, their soft or hard look, their outline, size, height, direction, all vary rapidly, yet each is significant. There is a peculiar aspect of the clouds before and during westerly winds which differs from that which they have previous to and during easterly winds, which is one only of the many curious facts connected with the differing natures of easterly and westerly currents of air throughout the world, which remain unchanged, whether they blow from sea to land, or the reverse.†

"Perhaps some of those who make much use of instruments rather undervalue popular knowledge, and are

* In south latitude the south wind corresponds to our north wind in nature and effects. The easterly and westerly winds retain their respective peculiarities in both hemispheres.

† Exclusive of local land and sea breezes of hot climates.

reluctant to admit that a 'wise saw' may be valuable as well as a 'modern instance;' while less informed persons who use weather-glasses unskilfully, too often draw from them erroneous conclusions, and then blame the barometer.

"Not only are reliable weather-glasses required at the smaller outlying ports and fishing places, but plain, easy, intelligible directions for using them should be accessible to the seafaring population, so that the masters of small vessels, and fishermen, might be forewarned of coming changes in time to prepare for them, and thus become instrumental in saving much property and many lives."

The works of Humboldt, Herschel, Dové, Sabine, Reid, Redfield, Epp, and others, confirm these views.

Acting on the foregoing views the Board of Trade have, during the past year, sanctioned (by way of experiment) some assistance being given by government to enable poor fishermen, and those employed on the more exposed shores of the British Islands (when unable to afford the expense themselves), to benefit by the use of weather glasses.

Ten substantial barometers, strongly made, durable, and easy to observe, have been already located as experimental loans at the following fishing stations:—Newhaven, Anstruther, Arbroath, Rosehearty, Whitehills, Port Easy (Portessie), Lybster, Dunheath, and St. Ives (Cornwall). Another will be placed in Mounts Bay. The Scotch Fishery Board have aided in this matter. Full instructions for observing and using the instruments have accompanied them to each place.

In the west of England; on the east coast of England; on the north-west coasts of Ireland and Scotland, and in the Shetland Islands, there is much need of such instruments.

Disasters and loss of life among the fishing population of our coasts, more especially in Banffshire, Lerwick, and Innishowen, have been narrated in the public prints. Many of these calamities might have been avoided by the judicious use of weather-glasses.

The Board of Trade have published a manual of instructions for the use of barometers and thermometers as weather-glasses, in two forms, one for fishermen and coasters, the other for young officers at sea.*

LIQUID MANURE.

The following is extracted from an article "On the Manuring of Grass Land," contributed by the Rev. W. R. Bowditch, of Wakefield, to the last number of the *Journal of the Royal Agricultural Society*:—

"The omission of sewage would render this paper culpably incomplete, and yet the application of sewage even to grass must ever be limited. The excessive quantity of water which must be put on in order to obtain sufficient fertilizing matter is so large, that the prudent and profitable application appears to me to be restricted to localities where it can be got on the land by the force of gravity, and where the soil is so porous and sloping as to allow a rapid removal of the excess of water. Moreover the grass grown by sewage requires to be frequently mown to prevent rotting, and therefore soiling seems the correlative of sewage manuring. That soiling will pay on a large scale, except for the production of milk and butter remains to be proved, and if it do not pay there is an end of the matter. Farmers and landowners cannot afford to sacrifice their incomes to crotchets, nor, in our densely peopled country, can we spare the produce of a single acre of available land. The Craigentinny meadows, near Edinburgh, afford a splendid instance of success due entirely to a judicious application of sewage, and wherever the same conditions obtain sewage should be applied in like manner. A ready and cheap vend for

dairy produce, the means of applying the sewage by gravity, or at most by one pumping (as on some of the Edinburgh land), without any outlay for costly apparatus of distribution, and above all porosity and declivity of soil adequate for the removal of surplus water, are conditions to be fulfilled before a reasonable expectation of profit can be entertained. Where these meet, the farmer will do well to try a few acres, and extend his breadth of sewage irrigation accordingly as he finds it pay. It is far better that the sewage of towns should run to waste into the ocean, than that our cultivators should apply it to the land and lose money by the application.

"Of course I know what imaginative theorists will say to this, but after reading all their arguments (and sophisms too), and weighing against them the sober truths of experience and analysis, I can come to no other conclusion.

"But may not the farmer irrigate with his own home-made liquid manure? Where he has command of water and can do it without a constant charge for labour he may, but otherwise I entirely concur in the sentiment of one of our leading agriculturists: 'I am more and more averse to liquid manure: the labour is endless.'

"Let the liquid manure be mixed with soil, finely sifted ashes, and such other material as the farmer can command, and the compost applied liberally to the grass of the farm, and the profit thus derived will far exceed that to be made by the costly plans which have recently been proposed for adoption.

"I must observe, however, that the most prolific source of grass manure is human excreta, now expensively wasted in town sewage. Large sums of money are now expended to enable us to waste what may be economized with advantage in every way. The present absurd water-carriage of excreta must be abandoned, and even employed for their legitimate purpose, viz., to carry away waste water to its natural receptacle, the river. Movable boxes should be attached to every house, and removed weekly in summer, fortnightly in winter. A cistern filled with dry pounded clay would be placed overhead, and a simple mechanical contrivance would throw down a measured quantity of this every time the handle was raised as water is now let down a closet. Nature's deodorizer and disinfectant would prevent the escape of injurious exhalations, and the refuse would be removed by water or other carriage some miles into the country, to await under sheds the farmer's season of use. This manure could be screened and applied by distributors, and would produce crops of grass which experience alone will enable us to estimate. Every element of gas is contained in this manure in large abundance, and while its preparation formed a sanitary improvement of much value to towns, its use would be a boon of enormous value to the country."

BISCUIT FODDER.

The following is extracted from the *Morning Post*:—

This is the name given by M. Naudin, a veterinary surgeon of the Imperial Guard, to a preparation of his invention, which has already been successfully tried in some cavalry barracks, and would seem, besides other advantages, to solve the problem which at present engrosses the attention of the agricultural world, viz. a sufficient supply of fodder for cattle in times of scarcity occasioned by drought. This biscuit fodder is composed of all kinds of substances generally given to horses and cattle, such as straw, hay, clover, oats, barley, &c. To these may be added many others, such as the refuse of the wine-press, the pulp of various roots, the stalks of millet and maize, the leaves of the vine, the husks and of certain trees, the sweepings of the barn and hay loft, which contain a vast quantity of nutritious matter in the flowers and seeds of hay which are generally thrown away, &c. All these ingredients are

* These may be purchased, 6d. each, of J. D. Potter, 31, Poultry.

chopped together; a mucilage of barley-flour is then added, with a little salt, and the mixture is then left to itself for a few hours until a slight fermentation has set in, when it is put into square moulds, made into cakes, and left to dry in a current of warm air. In this state it may be preserved for a great length of time. When it is to be used, it is moistened with about one-fifth of its weight of water; each cake is broken into seven or eight bits, and put into the manger or nosebag, as the case may be. The cakes should weigh about a pound each; 20 cakes of that weight are sufficient for the daily ration of a horse. The advantages which this preparation offers are evident; mastication and digestion are rendered easier, and therefore the general health of the animal ensured. A sufficiency of fodder can be laid in store for the winter; the rearing of cattle need not be checked for want of food, and the waste occasioned by the animals themselves while they eat at the manger, letting half their allowance fall on the floor of the stable, is obviated. The hackney-coach horse, which eats its hay at the stand, often soiled with mud and filth, will find in the biscuit fodder a clean and wholesome aliment; horses conveyed on railways, and especially on board ship, can be easily fed, the stowage of a sufficient quantity of these cakes for a long voyage taking up but little space, while all danger of fire and spontaneous combustion, of so frequent occurrence in hay lofts, is completely obviated. Lastly, these cakes may be used as convenient vehicles for any kind of drugs which it might be necessary to administer.

SILKWOORM (*AYLANTHUS GLANDULOSA*).

The *Aylanthus glandulosa*, on which the new silkworm lately introduced into France by M. Guérin Menneville, feeds, as recorded in last week's *Journal*, p. 630, grows readily in our English gardens, though it has not yet acquired an English name. It is frequently found on the continent among the Boulevard trees, for which its fine appearance and fast growth render it suitable. Its flowers, however, smell abominably, but luckily they last only a short time. It is of Chinese or rather Japanese origin. The French give it the name of "Vernis du Japon," under a mistaken idea that the tree produces varnish. This, however, is not the case. Varnish is obtained from a plant something like it, but in reality altogether different—a sort of "Rhus" or "Sumach."

SOUTH KENSINGTON MUSEUM.

During the week ending 11th Sept., 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,079; on Monday and Tuesday (free evenings), 5,738. On the three Students' days (admission to the public 6d.), 760; one Students' evening, Wednesday, 135. Total, 10,707. From the opening of the Museum, 592,147.

Game Correspondence.

MECHANICS' INSTITUTIONS AND SECONDARY EDUCATION.

SIR,—Your correspondent "J. C. B.," in the *Journal* of 27th August, proposes a plan for promoting secondary education, such as is usually given or ought to be given by Mechanics' Institutions, and, having carefully considered the matter in all its details, courts objections to it. I see several objections, not only to its being practicable, but to its being efficient for the purpose required.

In the first place, I doubt if so small an annual sum as the largest he names would prove a sufficient stimulus for that continuous study which is indispensable for proficiency, or whether it would really be any additional

value to the certificate of the Society of Arts, the benefit of which has in many cases proved so very great as to be beyond a money appreciation. Indeed, I think much importance ought not to be attached to pecuniary rewards except it may be as a peculiar distinction to very superior attainments. The certificate, as a proof of merit, is the principal object of ambition, and making the gain of a prize an ordinary result of the examinations, is more likely to clog the whole scheme from the inevitable difficulty of obtaining the requisite funds. If the Society of Arts be enabled to carry out the system of examinations to the fullest extent, and their certificates be solely relied upon as the advantage to be acquired, there is an infinitely better prospect of success than if year by year money prizes were looked for, and want of means compelled the refusal of the anticipated grants.

Another objection is the almost insuperable difficulty of effectually carrying out such a scheme with anything approaching a satisfactory result. It would involve a complicate machinery of organisation almost impossible of attainment, and an expenditure even greater than the benefit conferred. It is also very doubtful whether the successful candidate would be any real gainer in the end. The few shillings paid as the reward of his studies would be so much less paid by himself, as the majority of the recipients would be already members of a provident society, so that the payment for his future use would be practically a present payment to himself.

Another difficulty, though not perhaps one of the same magnitude, is the want of continuous residence by a great number of those who would be candidates for examination. Many young men, having few local ties, seek to advance their position in life by removal to more active centres of manufacturing or commercial enterprise. With the certificate of the Society of Arts, as a testimonial of competency and good character, they seek employment elsewhere, and the annual payment would therefore involve an expense and trouble in the shifting of its application more than its real worth.

But if the scheme should prove successful in inducing a great number of candidates to strive for and obtain the coveted certificate,—if the many hundreds or even thousands of our young men who are capable of the desired attainments should swell the annually-increasing roll, from what source will the annual funds be supplied, or what security will be expected or can be given for annuities varying from 2s. to 7s. 6d., amounting in the aggregate to many pounds, and each item requiring careful supervision for its faithful administration. I doubt if "J. C. B." could follow out his well-meant suggestion by devising any mode of proceeding that would be really practicable.

The Society of Arts will do more real service by efficiently organising local Boards of Examiners, so that the advantages may be, as far as possible, brought home to the greatest number, and by confining the attention of the candidates to the value of the certificates as a legitimate object of ambition. If, however, it be thought desirable to add prizes, whether of books, money, or instruments, they should be provided from local sources, or given only in special cases, marking thereby the extra proficiency of the recipient. In any case, however, they should be but of secondary importance, so that the true value of the certificates be not in any way diminished, nor their acquisition thought less desirable. A reward should have some appreciable value, either present or prospective, but it would be difficult to discover what incentive to studious application in one of the difficult sciences would be afforded by an annuity of 2s. 6d., which is proposed for the holder of a third-class certificate, who would constitute by far the largest number. He may form, and not unjustly, the highest notions of the benefits he may gain as the holder of the certificate—the evidence of his attainments—but his hopes will hardly be elevated by the acquisition of the proposed addition, trifling in itself, though costly in the aggregate.

I believe that far more practical good would be accomplished by enabling the local boards to examine the members of Mechanics' Institutions, and award certificates for proficiency in the elementary branches of education. It would prove in many cases a very useful stimulus to exertion, and these minor certificates might be made a condition for examination in the higher branches. Unfortunately, and in Yorkshire especially, there are many institutions where the elementary branches form the chief staple of education. These often require some inducement to promote attention, and though in most cases such examinations might be carried on very effectively by the respective committees of management, and small prizes made the reward of merit, yet I believe that the honour of gaining a certificate from a competent authority would prove in many instances a far stronger incentive.

It is well, however, that the subject should undergo discussion. It will gain from publicity, and if those who are actively engaged in promoting mental cultivation amongst the great mass of our industrial population would use the columns of the *Journal* more frequently, it could not fail to have some beneficial effect in keeping attention alive to the subject.

I am, &c.,
BARNETT BLAKE.

Leeds.

EXHIBITION OF 1861.

SIR,—I cannot by any means agree with your correspondent "T. L. E.," in last week's *Journal*, as to Battersea being a more eligible site for the Exhibition of 1861 than Kensington Gore. I deny that the former has "the triple advantage of road, rail, and river," in the ample sense he means, and which is essential to the pecuniary success of the undertaking. It may have it for those who live on the Surrey side of the river, though that I doubt; but for the masses who reside on this, comprising, as it does, the wealth, intellect, and public spirit of the metropolis and its swarming suburbs (Islington, Camden Town, Bayswater, Paddington, Brompton, Kensington, Hackney, Clapton, Tottenham, &c., &c.), Hyde-park is in every way more convenient. Even in 1861, when railway, omnibus, and cab accommodation was comparatively scanty, the facilities afforded for cheap and rapid conveyance were obvious from the multitudes who daily crowded the aisles and galleries of the Exhibition, even to the last hour that it was open. It was the knowledge of this fact which mainly prompted the efforts made to retain the building permanently where it stood, even though the promoters could hardly hope to offer such interior temptations as those which it originally contained. The removal of it, therefore, to Sydenham was deemed by many to be a great mistake, and I presume that, though it now presents attractions of nature and art beyond those of any spot in the world, no one will pretend that it has been hitherto a successful speculation. This I wholly attribute to the difficulties, real and imaginary, of access, which the additional railway facilities recently opened up to the public have not overcome to any appreciable extent.

The site of a building to be frequented by the many should not only be easy of access, but also enjoy the advantage of ready means of return. This was eminently the case in 1851, and is so now at the South Kensington Museum, which is a sort of epitomised edition of the Great Exhibition. Being in the neighbourhood of the parks, it is convenient for carriage visitors during the London season, for pedestrians from the district, and for those who use cabs, omnibuses, and other public conveyances. For the accommodation of the increasing numbers who already visit that collection of so much that is exquisite and instructive in painting, sculpture, mediæval art, educational appliances, and scientific apparatus, many additional omnibuses run from Islington and elsewhere at very cheap rates. And when visitors desire to return,

they have no difficulty in finding these and other conveyances in abundance, close at hand. It fully answers the purpose of cab-proprietors to have "stands" near the Museum and elsewhere in Kensington and Brompton, for if they have not a sufficient supply of customers from that building, they can generally depend upon the miscellaneous wants of the district to make up the deficiency. Would that be the case at Battersea?

Even now, let those who return from the Crystal Palace by the new railway testify. I can speak from my own experience. For want of a populated vicinity, and therefore of a demand on which to depend, cabs are rarely to be found at the Battersea terminus, and omnibuses never. The last resource is the river, and if the supply of steamboats fails—and at present it is anything but abundant—those who have not their own vehicles are in a sorry plight, especially in bad weather.

But, besides all this, what do the thousands who now come up from the manufacturing districts know of Battersea? It is a terra incognita probably to the greater part of the residents of London, and of its northern and eastern districts, and can we imagine that it is less so to strangers?

Those who visit London for a short time, do not take up their quarters at Battersea or anywhere on that side of the Thames, and, if disposed to do so, where would they find accommodation? Sightseers prefer to frequent hotels which are as nearly equi-distant as possible from all the London lions.

All this has reference solely to the immediate pecuniary part of the question, arising from the payment made for admission, but something more may be urged against the locality advocated by "T. L. E.," another score, viz., its moist and therefore dangerous atmosphere for works of art, and for fragile and coloured textures—in other words, for the bulk of the varied and valuable collection which is to constitute the attraction of the proposed Exhibition of 1861. Who, with the danger of damage from this unfortunate peculiarity, would trust their property within its walls? It may be that this normal condition of Battersea-fields is much improved by drainage, but few would be willing to test the fact at their own risk; and under any circumstances, the prejudice against the locality, on this account alone, has to be surmounted. I need not remind you that this is a slow process.

On the other hand, the locality of Gore-house enjoys a vast prestige, principally the result of actual experience in 1851. I hope, therefore; that taking this into account, and giving to the foregoing facts and arguments the weight to which they may be fairly entitled, the editor of the *Builder* will continue to advocate the site of Kensington as every way suited for the Exhibition of 1861.

I need scarcely add that I write all this simply as a member of the Society, and not of the Council, with none of whom have I conferred on the subject.

I am, &c., THOS. WINKWORTH.

Gresham Club, Sept. 15, 1858.

Proceedings of Institutions.

BRISTOL.—A meeting of the Board of Examiners for distribution of prizes and certificates awarded by the Society of Arts to successful candidates from the Athenæum, was held on Monday evening, in one of the classrooms. The Rev. Canon Girdlestone presided on the occasion, and in opening the proceedings of the evening said, that as the chairman of the local board of Examiners in connexion with the Society of Arts, then allotted to him the very pleasing office of announcing amongst the successful candidates at the Athenæum in the early part of the year, certificates of proficiency and prizes

awarded to them. The Rev. Canon went on to speak of the efforts made for the improvement of middle-class education by the Universities of Oxford and Cambridge, and by the Society of Arts, congratulating his hearers on the results which had followed these examinations, especially the one which had taken place in connexion with the Bristol Athenæum, there having been only one failure, and also on the fact of permission having been first obtained through the instrumentality of this institution for ladies to compete. Throughout the whole country there had been only one other lady who had been successful, while the Bristol Athenæum had furnished four who had obtained certificates of proficiency in the French language. There were two gentlemen who had obtained certificates of proficiency in free-hand drawing; and one gentleman who stood alone in the list, to whom would be awarded a prize of £5, a prize of £3, and two certificates of excellence. Seeing that these prizes were bestowed for algebra, and conic sections, for trigonometry and similar subjects, he (the rev. canon) had no doubt that this young gentleman's read would be strong enough to bear the honours he had earned; and he congratulated the Bristol Grammar School on having produced so proficient a pupil. In conclusion, the rev. canon expressed a hope that the success which had attended the past examination would induce a still larger competition next year, and that the results would be proportionately gratifying. The following were the successful candidates to whom prizes and certificates were awarded amidst loud cheers:—Miss Eliza Hall and Miss Elizabeth McArthur, pupils of Athenæum French class, under M. de Candolle—certificates of proficiency in French; Miss Margaret Lydia Lovell and Miss Alice Davies, pupils of Athenæum French class, under M. de Candolle—certificates of competency in French. Francis Stone Evans, pupil of Bristol Grammar School, C. T. Hudson, Esq., master—1st prize, £5, conic sections; 2nd prize, £3, in algebra; certificate of excellence in arithmetic, algebra, and conic sections; certificate of proficiency in geometry, trigonometry, and conic sections. Thomas H. Yabbicom and James Craik, pupils of Mr. E. Beeks, Athenæum drawing master—certificates of proficiency in free-hand drawing. John Morris Harris, pupil of Athenæum French class, M. de Candolle—Certificate of competency in French. Mr. M. Whitwill proposed a vote of thanks to the examiners, especially to those who were not directors of the Athenæum, which was seconded by Mr. Bell, and carried by acclamation. The Rev. Canon Girdlestone acknowledged the compliment, and stated that although his connexion with the Athenæum, from the commencement, had been a pleasurable one, nothing had given him greater pleasure than the examinations out of which the proceedings of that evening had arisen.

LONDON DERRY.—The last report of the Young Men's Literary Association, speaks of the continued prosperity of the Institution. Its funds are satisfactory, its members are numerous, and the society is daily progressing in public favour. The want of such an association had long been felt in the city, and those who succeeded, at such personal trouble, in establishing the present society, may now rejoice to find that its advantages are most universally appreciated, and that their young fellow-citizens are turning to practical account the facilities offered for instruction and improvement. During the past year the committee have exerted themselves to furnish the members with those facilities. The reading-room has been copiously supplied with newspapers and periodicals, lectures have been delivered, and sub-associations, for the departmental promotion of the great literary objects of the Society, have been spontaneously established by the members. Foremost among these they would notice the discussion class. In this class, debates, dissertations, essays, and other literary efforts, form the business of weekly meetings; and the good results of this system of educational training were pleasingly exemplified

on the occasion of a soiree recently held in connexion with this department of the association, and at which the addresses of the several speakers were such as would do credit to gentlemen of much higher pretensions. The committee trust that this discussion class will go on and prosper. They regard it as the germ of a valuable and most desirable movement. The progress of the other classes has been also cheering. In the Mercantile, French, and Music Classes, the work has been carried on with spirit, and with very considerable benefit to the pupils. With reference to lectures, Mr. Fitzgibbon, Q.C.; Mr. Henry M'Cay, LL.B.; Dr. Babington, Mr. Patterson, and Professors Dickie, Partington, and Thompson, with other gentlemen, have kindly given their services as lecturers during the season. Their lectures were, generally speaking, well attended; and, in reference to those held under the auspices of the Board of Trade, it affords the Committee no ordinary satisfaction to congratulate the Society on several of its members having eminently distinguished themselves in the subsequent examinations. Numerous prizes have thus been obtained by members of the Association. The new rooms of the Association, in Shipquay-street, occupy a most central and respectable position, and have been found most advantageous to members. In conclusion, the Committee desire to remind the Society that, unassisted by the members themselves, they can do but little. What they require is the active and persevering co-operation of the members. Let every person in the Association act as though he had an individual interest to maintain and an individual object to advance. Let the members urge their friends to join the society, and participate in those advantages which they have themselves experienced. If this be done, there need be little doubt that the Institution will flourish, and that it will enjoy a prosperous and permanent existence.

POOLE.—In the report of the Town Library Literary and Scientific Institution, for 1858, the Committee congratulate the members on its continued prosperity. They cannot, however, but regret that little has been done towards reducing the debt still remaining. The lectures during the year have entailed a heavy expense on the Institution. Nine lectures have been delivered, at a cost to the Institution of £25 17s. 4d.; the receipts for which have only amounted to £6, thus leaving a loss of about £24 4s. on each lecture. Every care has been taken to prevent unnecessary expense in the arrangements for them, but it must be evident to all that if lectures are to be given, and if the members have the privilege of attending them gratuitously, they will always add considerably to the annual expenses; also, that if good lecturers are to be engaged, whether gratuitous or otherwise, if not residing in the immediate neighbourhood, the expense of each lecture cannot be much reduced. It should be recollected, in considering the expenses of the lectures, that the members, through a reciprocation of privileges with the Mechanics' Institution, have had the opportunity of attending also six lectures delivered for that Institution, without any expense to the Town Library. The conversazione also, for 1857, owing to the evening on which it was held proving very wet, preventing numbers from attending, instead of adding to, has drawn rather heavily on the funds—that, and the labour the arrangements entail on a few individuals, will prevent its being repeated annually, as was at first hoped might be the case by its promoters in the committee. The principal feature in the progress of the institution has been the establishment, from the nucleus that already existed, of a Museum of Local Natural History, Geology, and Antiquities. It is still in embryo, but the committee hope that in a few years it will become, by the combined efforts and hearty co-operation of the members and friends of the Institution, a first-class county museum, and prove an attraction to the town, which has at present but few objects of interest for the visitor. The committee earnestly invite the members and friends of the institution to visit the Museum, and to assist in the collection,

and by the donation of objects. In the possession of some of the ancient families of the town there are probably many relics of the past history of the town and county, which might be advantageously deposited by the present possessors in such a Museum, and by entrusting them to the care of the committee for the museum, they might render a great service to the town. The curator reports that donations of money amounting to £9 10s., in aid of the museum fund, have been already made, and enumerates various deposits of materials for the museum which have been kindly placed in his hands.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Sept. 10, 1858.]

Dated 10th May, 1858.

1040. C. F. Vassero, 45, Essex-street, Strand—Improved driving machinery, applicable either for thrashing, winnowing, cleaning, and bruising grain, cutting straw, or other agricultural purposes. (A com.)

Dated 12th July, 1858.

1020. C. F. Vassero, 45, Essex-street, Strand—An improved artificial manure. (A com.)

Dated 12th August, 1858.

1036. G. Metzler, Great Marlborough-street, and J. Waddell, Brompton—Imp. in the construction and formation of valve musical instruments.

Dated 13th August, 1858.

1054. T. G. Peangely, 5, Chestnut-terrace, Waltham-croos, Hertfordshire, and H. Brown, Old-road, Enfield Highway—Imp. in apparatus for straightening gun-barrels.

Dated 14th August, 1858.

1056. J. Smith, Seaford, near Liverpool, and S. A. Cheese, Liverpool—Improved arrangements for obtaining and applying motive power.

1062. G. Betjemann, G. W. Betjemann, and J. Betjemann, Upper Ashby-street—An imp. in book slides.

Dated 21st August, 1858.

1002. G. J. Walker, Norton Folgate—Improvements in funeral carriages.

1004. R. A. Brooman, 166, Fleet-street—Imp. in sewing machines. (A com.)

1006. C. De Jongh, Lautenbach, near Guebwiller, France—Imp. in machinery for combing and heckling fibrous materials.

1008. W. W. Harrison, Sheffield—An imp. in croet and liqueur stands.

Dated 23rd August, 1858.

1010. F. Puls, Roxburg-terrace, Havertock-hill—Imp. in the distillation of bituminous matters and gas tar.

1014. A. Boyle, Birmingham—Imp. in the manufacture of certain parts of umbrellas and parasols, and in machinery employed in the said manufacture.

1016. H. D. Jencken, London—Imp. in electric telegraphs. (Partly a com.)

1018. W. H. Harfield, Fenchurch-street—Imp. in windlasses.

Dated 24th August, 1858.

1020. C. A. Schrader, Flinsbury-square—An instrument to be used in boring, for mining or other purposes.

1022. J. Hise and A. Abrahams, St. John-street-road—Imp. in book slides or holders.

1024. J. Macintosh, North Bank, Regent's-park—Imp. in insulating telegraphic wires or conductors, and in apparatus employed therein, part of which apparatus is applicable to the manufacture of tubes from India rubber.

Dated 25th August, 1858.

1026. H. B. Barlow, Manchester—Certain imp. in machinery for preparing flax, wool, and other fibrous materials. (A com.)

1027. T. Hill, Heywood, Lancashire—Imp. in machinery or apparatus for punching and shearing metals.

1029. R. A. Brooman, 166, Fleet-street—Imp. in the treatment of vegetable substances in order to convert the fibrous portions thereof into pulp. (A com.)

Dated 26th August, 1858.

1031. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in bellows. (A com.)

1033. J. Black, Edinburgh—An improved mode or means of obtaining, applying, and transmitting motive power.

1035. S. N. Rodier, 21, Oak-village, St. Pancras—Imp. in apparatus for regulating gas.

Dated 27th August, 1858.

1037. D. Graham-Hope, Manchester—Imp. of locomotive and other steam engines.

1038. T. Trotman, 253, Albany-road, Camberwell—Imp. in hair pins.

1039. J. Ellison, Liverpool—Imp. applicable to reading chairs, and other articles used to sit or recline upon.

1040. F. Matley, Paris—Certain imp. in apparatus for regulating the flow of gas, and for improving its illuminating power. (A com.)

1041. W. S. Clark, Banbury—Imp. in reeling or furling sails from the deck of vessels. (A com.)

1042. W. Eason, Cheltenham—Imp. in wet gas meters.

1048. H. W. Hart, 69, Fleet-street—Imp. in the application of gas to chandeliers.

1044. F. J. Evans, Chartered Gas Works, Horseferry-road, Westminster—An imp. applicable to gas purifying.

1045. A. V. Newton, 68, Chancery-lane—Improved machinery for sorting silk or other thread according to its size or thickness. (A com.)

1046. W. E. Newton, 68, Chancery-lane—Imp. applicable to vessels employed in the manufacture of glass, or the melting of vitreous substances. (A com.)

1047. W. Kempe, Holbeck Mills, Leeds—Imp. in apparatus used for winding woollen and other fabrics on rollers, in order to such fabrics being balled or fished when on the rollers.

1048. John Fowler, junr., Corahill, and R. Burton, Kingsland-road—Imp. in the construction and arrangement of locomotive and other carriages, to facilitate their movement on common roads and other surfaces.

1049. R. Knight, Foster-lane, London—Imp. in apparatus for aerating liquids.

Dated 28th August, 1858.

1051. G. White, 34, Dwygate-hill, Cannon-street—Ambulatory furniture for apartments. (A com.)

1053. G. Coode, Westminster—Imp. in the adjustment of hose in machines for distributing liquid manure and other liquids over land; also for an improved method of, and apparatus for, manufacturing the hose to be used with such machines or otherwise, and for gathering and puckering canvas, flax, leather, and other textile and membranous substances.

1055. G. Weedon, 4, Poland-street, and D. W. Rice, 11, New-road, Woolwich—An improved knife and furk cleaning machine, part of which is applicable to other purposes.

Dated 30th August, 1858.

1057. J. Platt and E. Hartley, Oldham—Imp. in certain parts of machinery for preparing and spinning cotton and other fibrous materials.

1059. J. Brazil and J. McKinnell, Manchester—An improved method of indigo blue dyeing. (A com.)

1061. J. Brazil and J. McKinnell, Manchester—An improved method of indigo blue dyeing.

1063. J. Oxley, Oxenden Town—Imp. in baths.

1065. J. L. Clark, Adelaide-road, Middlesex, F. Braithwaite, Bridge-street, Westminster, and G. E. Procoe, Bernard street, Middlesex—Imp. in telegraph cables.

1067. L. Wiar, Cambrai, France—An improved mode of generating steam or heating water or liquids.

1069. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the construction of governors or regulators for steam engines. (A com.)

Dated 31st August, 1858.

1073. M. A. F. Mennois, 39, Rue de l'Echiquier, Paris—An improved apparatus for mounting the driving bands of machinery in movement. (A com.)

1075. J. Stoneham, Audenshaw, near Manchester—Imp. in cleaning and treating cotton and woollen waste or other fibrous materials, and in extracting oil or grease therefrom.

INVENTIONS WITH COMPLETE SPECIFICATION FILED.

2022. G. G. Bussey, 12, Arthur-street, New Oxford-street—Holding and carrying carriages.—7th September, 1858.

2023. W. Tucker, Rhode Island, U.S.—An improved variable boring bit.—7th September, 1858.

WEEKLY LIST OF PATENTS SEALED.

September 10th.

449. S. Wheatcroft.
511. S. T. Parmelee.
512. G. Pigott.
517. S. T. Osmond and E. D. Collins.
518. J. C. Martin.
520. R. Edwards.
522. R. A. Brooman.
526. J. Aled and J. Crabtree.
529. A. Wallis and C. Haslam.
531. E. A. L. D'Argy.
532. D. Gallafent.
533. G. Hall.
537. P. Le Capelain.
561. R. Glanville.
569. G. Williams & E. Rowley.
571. D. Evans.
596. A. Lester.
607. E. Coulton.
639. P. H. G. Bérard.
669. J. A. Breckon & R. Dixon.
697. H. Ward.
719. W. Clark.
220. W. B. Clark.

779. W. G. Armstrong.
786. J. Bailey, E. Oldfield, & S. Oddy.
811. J. H. Johnson.
833. E. F. Sane.
835. A. A. Lefebvre.
859. W. Clark.
861. J. Whiteley.
865. G. Flayayson.
929. J. Fraser.
947. A. V. Newton.
951. J. Martin.
963. B. E. Guyot de Brun.
979. W. Hopkinson and J. Dewhurst.
1049. J. Luis.
1061. J. Dyson, E. W. Shire, and H. Shire.
1315. J. Luis.
1431. C. W. Cahoon.
1458. W. E. Newton.
1603. A. V. Newton.
1645. W. Simons.
1658. W. Northan.

PATENTS ON WHICH THE STAMP DUTY OF 250 HAS BEEN PAID.

September 6th.

2047. E. Sharpe.

September 7th.

2032. R. B. Feather.

2058. J. C. G. Kennedy.

2111. J. Willis.

September 8th.

2057. M. Curtis and J. Wain.

September 8th.

2063. F. G. Spilbury & F. W. Emerson.

September 10th.

2071. A. Loughborough.

2092. J. Lawrence.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 24, 1858.

PRODUCTION OF ORGANIC BODIES WITHOUT THE AGENCY OF VITALITY.

The following is an abstract of a lecture delivered at the Royal Institution, by Professor E. Frankland, F.R.S., F.C.S. :—

The earliest researches of chemists brought them into contact with two classes of bodies, distinguished from each other by well-marked and obvious peculiarities. One of them was met with in the inanimate or mineral kingdom, the various materials of which were distinguished by their comparative stability or resistance to change, and by the facility with which the greater number of them could be artificially produced from the elementary bodies composing them. The other class of bodies was found exclusively in the animal portion of creation, or was directly derived from the productions of the organs of plants and of animals: these compounds were distinguished by their proneness to undergo change, and by the impossibility of producing them by artificial means. By no process then known to chemists, could the elements composing these latter bodies be made to unite, so as to produce compounds, either identical with, or analogous to, the substances generated by the organs of plants and of animals. These substances were consequently, from their origin, termed organic bodies or organic compounds. They were regarded as dependent for their origin upon the influence of that aggregate of conditions sometimes called vital force; and it was generally believed, that we should never succeed in producing these bodies artificially, until we could form and endow with vitality the organs from which they were derived.

Such was the state of knowledge and opinion until the year 1828, when Wöhler succeeded in artificially producing urea, a body which had up to that time been known as a product of the animal organism.* This discovery was followed many years later by the artificial formation of acetic acid, which was produced by Kolbe from a mixture of protochloride of carbon, water, and chlorine exposed to sunlight, the chloroacetic acid thus obtained being afterwards converted into acetic acid by an amalgam of potassium. The subsequent production of methyl by the same chemist from acetic acid, added one of the organic radicals to the list of compounds producible from their elements. Although little further progress was made for several years in this department of chemical research, yet the artificial production of urea and acetic acid, together with their derivatives, completely broke down the barrier between so-called "organic" and "in-organic" bodies; and although the name "organic" was still retained for the class of bodies to which it had previously been assigned, it was now obviously no longer strictly applicable.

The recent ingenious researches of M. Berthelot have greatly extended this branch of chemical inquiry, and have in a most important degree increased the number of bodies capable of artificial formation. The production of chloride of methyl and the members of the olefant gas family up to amylene ($C_{10}H_{16}$), furnish us with the whole series of alcohols and their derivatives, from amyl alcohol downwards. Phenyl alcohol and naphthaline, both artificially produced by Berthelot, yield a host of interesting bodies; whilst phenylcarbamie acid enables us to step from the phenylic to the salicylic

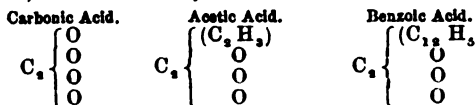
group, since, when treated with hyponitrous acid, it yields salicylic acid. Lastly, M. Berthelot has succeeded in artificially forming glycerine, the basis of animal and vegetable oils and fats, and also in forming grape sugar; the latter however is obtained by the contact of glycerine with putrifying animal matter, and consequently cannot be said to be produced altogether without the agency of vitality; although the putrifying organic matter contributes none of its constituents to the new compound, and does not undergo any appreciable change in weight or appearance during the process. These substances yield such a numerous class of derivatives, that upwards of 700 distinct organic compounds can now be produced from their elements without the agency of vitality.

The processes employed for the artificial production of these bodies, though deeply interesting, present, with one or two exceptions, little or no analogy to the natural mode by which organic compounds are formed in the tissues of plants; but the speaker endeavoured to show, that a close attention to the nature of the inorganic materials assimilated by the vegetable kingdom, and their relations to the more important organic compounds derived from plants, leads to the belief that such compounds can be successfully produced by processes strictly analogous to those employed by nature. He contended that the constitution of the so-called organo-metallic bodies, in which the production of complex organic compounds from inorganic ones by the replacement of elements by organic groups can be so clearly traced, afforded a valuable clue to the formation of organic bodies in general, and led directly to the conclusion, that if the organic compounds of the metals be formed upon the model of the oxides of the respective metals, the organic compounds of carbon (that is, all organic compounds) are formed upon the model of the oxides of carbon.

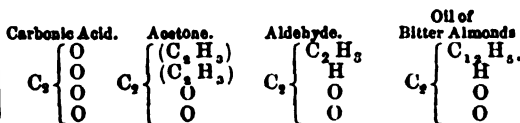
It has long been known, that with slight and unimportant exceptions, the only materials employed by nature in the construction of the most complex organic compounds, are carbonic acid, water, ammonia, and nitric acid. The fact that a vast number of organic compounds are cast in the molecular mould of water, has been proved by the ingenious researches of Williamson and Gerhardt; whilst the wonderful fertility of the ammonia model has been amply demonstrated by the labours of Hofmann and Wurtz. It would also not be difficult to prove the claim of nitric acid to be considered as a third model upon which a number of other organic compounds are built up; but it was necessary to confine attention on the present occasion to the consideration of carbonic acid only, as a model upon which a very large number of organic bodies are formed.

Guided by the constitution above referred to of the organo-metallic bodies, and bearing in mind the replaceability of the oxygen in water and binoxide of nitrogen, and the chlorine in terchloride of phosphorus, by organic radicals, Professor Kolbe and the speaker were led to the following hypothesis regarding the constitution of several important classes of organic compounds.

1. The replacement of one atom of oxygen in carbonic acid by hydrogen or its homologues, produces an organic acid, either of the fatty or of the aromatic series, thus :—

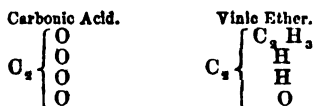


2. The like replacement of two atoms of oxygen in carbonic acid, produces either an acetone, or an aldehyde, thus :—

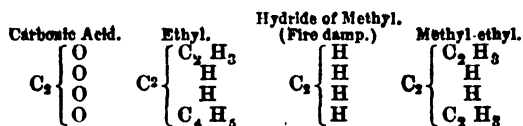


* The artificial formation of urea from cyanate of ammonia was exhibited under the influence of polarised electric light.

3. The like replacement of three atoms of oxygen in carbonic acid, produces an ether, thus:—



4. The like replacement of all the atoms of oxygen in carbonic acid, produces a radical, a hydride of a radical, or a double radical, thus:—



The authors of this hypothesis now attempted to verify it by direct experiment. They endeavoured to avail themselves of the powerful affinities of zincethyl, in order to effect the substitution of oxygen in carbonic acid, and sulphur in bisulphide of carbon, by ethyl; these attempts were, however, at best only partially successful; the reagent, the zincethyl, was not sufficiently powerful to rival the action of plants in the decomposition of carbonic acid; and its effects upon bisulphide of carbon resulted in the production of a number of organic bodies containing sulphur; and although one of these appeared to have the formula of sulphopropionic acid ($\text{C}_3 \text{H}_5 \text{S}_2 + \text{H S}$), yet its complete separation and purification presented such difficulties, that it would have been hazardous to rely upon it as a proof of the correctness of their hypothesis. In short, the verification of these views was not permitted to their authors, but was reserved for Mr. Wanklyn, who, in his newly-discovered sodium and potassium compounds of the organic radicals, came into possession of re-agents which enabled him at once to effect the desired substitutions. His memoir on the production of propionic acid by the action of sodium-ethyl upon carbonic acid,* which has just been communicated to the Chemical Society, proves the first proposition of a hypothesis, which considerably simplifies our views of the molecular structure of organic bodies, and which, if proved to be throughout correct, cannot fail to enable us greatly to increase the number of organic compounds capable of being procured from their elements without the intervention of vitality.

The speaker then referred to the following list of important organic bodies, selected from the large number above spoken of, as being capable of artificial formation from their elements:—

Name.	Formula.
Oxalic Acid	$\text{C}_2 \text{O}_3, \text{H O}$
Hydrocyanic Acid	$\text{C}_2 \text{N}, \text{H}$
Light Carburetted Hydrogen ...	$\text{C}_2 \text{H}_4$
Urea	$\text{C}_2 \text{N}_2, \text{H}_4 \text{O}$
Formic Acid (Acid of Ants)	$\text{C}_2 \text{H O}_2, \text{H O}$
Chloroform	$\text{C}_2 \text{H Cl}_3$
Acetic Acid	$\text{C}_2 \text{H}_3 \text{O}_2, \text{H O}$
Alcohol	$\text{C}_2 \text{H}_5 \text{O}, \text{H O}$
Ether	$(\text{C}_2 \text{H}_5 \text{O})_2$
Olefiant Gas	$\text{C}_2 \text{H}_4$
Acetic Ether	$\text{C}_2 \text{H}_5 \text{O}, \text{C}_4 \text{H}_8 \text{O}_2$
Oil of Garlic	$(\text{C}_6 \text{H}_5 \text{S})_2$
Oil of Mustard	$\text{C}_6 \text{H}_5 \text{S}, \text{C}_2 \text{N S}$
Glycerine	$\text{C}_3 \text{H}_5 \text{O}_3$
Butyric Acid	$\text{C}_4 \text{H}_7 \text{O}_3, \text{H O}$
Pine Apple flavour (Butyric Ether)	$\text{C}_4 \text{H}_7 \text{O}_3, \text{C}_4 \text{H}_8 \text{O}$
Succinic Acid	$\text{C}_4 \text{H}_5 \text{O}_5, 2 \text{H O}$
Valerianic Acid	$\text{C}_5 \text{H}_9 \text{O}_5, \text{H O}$
Pear flavour (Acetate of Amyl) ..	$\text{C}_4 \text{H}_7 \text{O}_3, \text{C}_{10} \text{H}_{11} \text{O}$

* This conversion of carbonic acid into propionic acid, was experimentally demonstrated, and the remarkable properties of sodium-ethyl and potassium-ethyl were also exhibited.

Name.	Formula.
Apple flavour (Valerianate of Amyl)	$\text{C}_{10} \text{H}_{17} \text{O}_5, \text{C}_{10} \text{H}_{11} \text{O}$
Lactic Acid	$\text{C}_3 \text{H}_5 \text{O}_3$
Grape Sugar?	$\text{C}_6 \text{H}_{12} \text{O}_6$
Caproic Acid	$\text{C}_6 \text{H}_{11} \text{O}_2, \text{H O}$
Benzole	$\text{C}_6 \text{H}_6$
Nitrobenzole	$\text{C}_6 \text{H}_5 \text{N O}$
Aniline	$\text{N}(\text{C}_6 \text{H}_5)_3$
Phenyl Alcohol (Creosote)	$\text{C}_6 \text{H}_5 \text{O}, \text{H O}$
Picric Acid	$\text{C}_6 \text{H}_3 (\text{N O}_2)_3 \text{O}, \text{H O}$
Salicylic Acid	$\text{C}_{14} \text{H}_5 \text{O}_5, \text{H O}$
Salicylate of Methyl (Oil of Wintergreen)	$\text{C}_{14} \text{H}_5 \text{O}_5, \text{C}_2 \text{H}_5 \text{O}$
Naphthaline	$\text{C}_{10} \text{H}_8$

The artificial formation of urea, lactic acid, and caproic acid, is interesting in connection with certain functions of the animal economy. Pine-apple oil, pear oil, and apple oil, are instances of the artificial production of the delicate flavours of fruit, whilst oil of wintergreen and nitrobenzole are like examples of the formation of esteemed perfumes. But of all the bodies hitherto thus produced, alcohol, glycerine, and sugar, are undoubtedly the most deeply interesting, owing to the part they take in the nutrition of animals: they prove to us the possibility of producing, without vegetation or any vital intervention, an important part of the food of man. Should the chemist also succeed in forming artificially the nitrogenous constituents of food, without which life cannot be maintained, it would then be possible for a man, placed upon a barren rock, and furnished with the necessary apparatus and inorganic materials, to support life entirely without either animal or vegetable food. No one of these nitrogenous constituents has, however, yet been artificially produced, and the absence of all clue to their rational constitution forms at present a formidable barrier to their non-vital formation.

It would be difficult to conclude a subject like the present without any notice of the considerations which naturally suggest themselves, regarding the possibility of economically replacing natural processes by artificial ones in the formation of organic compounds. At present the possibility of doing this only attains to probability in the case of rare and exceptional products of animal and vegetable life. Thus valerianic acid, which, for a long time, was extracted from the root of the *Valeriana officinalis*, could now probably be more cheaply prepared from its elements; but a still cheaper source of this acid has been in the meantime discovered, viz., the oxidation of amylic alcohol, a waste product formed in the manufacture of spirit of wine, and obtainable at such a moderate cost as to prevent, in an economical point of view, the successful production either of amylic alcohol or valerianic acid by any artificial and exclusively non-vital processes at present known. It is also highly probable, that if we could produce artificially such bodies as quinine and the rare alkaloids, or alizarine and similar powerful and valuable organic colouring matters, we should be able to compete with organic life in the formation of these bodies; nevertheless, the discovery of the processes of artificial formation would doubtless be preceded by a knowledge of methods by which such rare bodies could be produced from more abundant and consequently cheaper forms of vegetable or animal matter; and it is therefore exceedingly improbable that any purely non-vital process will be successfully, and at the same time economically, employed for the manufacture even of such rare and valuable vital products. Such being the economical bearings of the case with regard to the rare and exceptional effects of vitality, when we turn to consider the great staple products of the animal and vegetable kingdoms, the hope of rivalling natural processes becomes faint indeed. By no processes at present known could we produce sugar, glycerine, or alcohol from their elements at one hundred times their present cost, as obtained through the agency of vitality. But, although our present prospects of rival-

ling vital processes in the economical production of staple organic compounds such as those constituting the food of man are so exceedingly alight, yet it would be rash to pronounce their ultimate realisation impossible. It must be remembered that this branch of chemistry is as yet in its merest infancy, and that it has hitherto attracted the attention of but few minds; and, further, that many analogous substitutions of artificial for natural processes have been achieved. Thus, under certain circumstances, we find it less economical to propel our ships by the force of the wind, and our carriages by animal power, than to employ steam power for these purposes. We do not find it desirable to wait for the bleaching of our calicoes by the sun's rays; and even the grinding of corn is no longer entirely confided to wind and water power.

In such cases, where contemporaneous natural agencies have been superseded, we have almost invariably drawn upon that grand store of force collected by the plants of bygone ages, and conserved in our coal fields. It is the solar heat of a past epoch that furnishes the power which we now utilise in our steam-engines. One important element in cheap production is time, and it is precisely in regard to this element, that we economically supersede, in the above instances, the contemporary resources of nature. Now time is also an important element in the natural production of food; and although it is true, that the amount of labour required for the production of a given weight of food is not considerable, yet it is nevertheless true that this weight requires a whole year for its production. By the vital process of producing food we can only have one harvest in each year. But if we were able to form that food from its elements without vital agency, there would be nothing to prevent us from obtaining a harvest every week; and thus we might, in the production of food, supersede the present vital agencies of nature, as we have already done in other cases, by laying under contribution the accumulated forces of past ages, which would thus enable us to obtain in a small manufactory, and in a few days, effects which can be realised from present natural agencies, only when they are exerted upon vast areas of land, and through considerable periods of time.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-eighth annual session of the British Association commenced at Leeds, on Wednesday last.

The new Town-hall has been placed at the disposal of the Association.

The general committee assembled at one o'clock—the President (the Rev. Humphrey Lloyd, D.D.), in the chair. The following noblemen and gentlemen were also present:—Lord Goderich, Lord Montague, the Earl of Enniskillen, Lord Wrottesley, Sir Roderick Murchison, Professor Owen, Dr. Whewell, Dr. Latham, Sir B. Brodie, Col. Sykes, M.P., Mr. E. Baines, Sir John Burnie, Professor Faraday, Mr. Hopkins (Cambridge), Sir P. Egerton, Major-General Chesney, Dr. Gladstone, Mr. Monckton Milnes, M.P., Dr. Lee, Dr. Norton Shaw, &c.

The GENERAL SECRETARY (Major-General Sabine) read the report of the council, which, having referred to the unsuccessful exertions made by the Association to induce the late Government to send a vessel to the vicinity of Mackenzie's River, for the purpose of obtaining in that region certain observations which recent discoveries in terrestrial magnetism have proved to be of high importance to science, proceeded to state that the council had added to the list of corresponding members of the Association the names of the following foreign gentlemen, who were present at the Dublin meeting, and made communications to the sections, viz.:—Dr. Barth; Professor Bolzani, of Kazan; Antoine D'Abbadie, of Paris; Professor Loomis, of New York; Visenza Pisani,

of Florence; Gustava Plaar, of Strasburg; Herman Schlagintweit; and Robert Schlagintweit, of Berlin. With regard to the president of the Association for the year 1859-60, the general committee having resolved at the Dublin meeting last year to make application to his Royal Highness the Prince Consort for permission to elect him to that office, had received a reply intimating that his Royal Highness accepted the office, conditionally upon his being in Scotland at the time of the meeting.

The report was received and adopted.

The Parliamentary Committee reported that the late President of the Board of Trade, on a representation made to him by the association of the insufficiency of the accommodations and staff at the meteorological department at the Board of Trade, had consented to the appointment of two additional clerks and a working optician, to be permanently attached to that department; and, moreover, supplied more enlarged accommodations, so that, upon the whole, Admiral Fitzroy, who presided over this meteorological department, had expressed himself satisfied with the present arrangements and hopeful as to the future success of an Institution which could not fail to be productive of vast benefit to science.

The association expressed its extreme regret that the application to the Government to send the expedition to the Mackenzie River was unsuccessful; but they anticipated an important accession to our scientific knowledge from the expedition to the Zambesi River, which was sanctioned and sent out under Dr. Livingstone. That expedition had been well supplied with the necessary instruments, properly tested at Kew, and comprised those who were fully competent to use them.

The appointment of the Right Hon. Joseph Napier to the office of Lord Chancellor of Ireland had caused another vacancy in the Parliamentary Committee. There are now, therefore, two vacancies, one of which they recommended should be supplied by the election of the Right Hon. Sir John Pakington, First Lord of the Admiralty. The committee, referring to the proposed severance from the British Museum of the natural history collections, expressed their strong disapprobation of such a course, observing that "they knew of no measure which might be adopted by the Government or Legislature which would inflict a deeper injury on science than the removal of those collections, if unhappily carried out."

The first general meeting of the association took place in the evening, at eight o'clock, when the Rev. Dr. Lloyd resigned the chair, and the new president (Professor Owen) delivered the inaugural address.

The following is a list of the different sections as at present arranged:—

- A.—MATHEMATICAL AND PHYSICAL SCIENCE.—President: The Rev. W. Whewell, D.D., F.R.S., &c.
- B.—CHEMICAL SCIENCE.—President: Sir John Herschel, Bart., D.C.L., F.R.S.
- C.—GEOLOGY.—President: Mr. Wm. Hopkins, LL.D., F.R.S.
- D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.—President: Mr. Charles Darwin, F.R.S.
- E.—GEOGRAPHY AND ETHNOLOGY.—President: Sir R. I. Murchison, D.C.L., F.R.S.
- F.—ECONOMIC SCIENCE AND STATISTICS.—President: Mr. Edward Baines.
- G.—MECHANICAL SCIENCE.—President: Mr. W. Fairbairn, F.R.S.

NATIONAL ASSOCIATION FOR THE PROMOTION OF SOCIAL SCIENCE.

The second annual meeting of this Association will be held at Liverpool on Monday, the 11th of October, and five following days. The local office and reception-room will be at St. George's Hall, Liverpool. The following prospectus, containing the order of proceedings and regulations for the meeting, has just been issued:—

I.—ORDER OF PROCEEDINGS.

MONDAY, OCTOBER 11.

Half-past One, p.m.—Meeting of the Council in the Library, St. George's Hall.

Half-past Three, p.m.—Special Service in St. Nicholas's Church. The Prayers will be read by the Rev. the Rector of Liverpool, and the Sermon will be preached by the Right Rev. the Lord Bishop of Chester.

Half-past Seven, p.m.—General Meeting in St. George's Hall. The opening address will be delivered by the Right Hon. Lord John Russell, M.P., and resolutions will be moved. Lord Brougham, the Earl of Shaftesbury, and other leading members of the Association, will take part in the proceedings. Seats will be reserved for Members and Associates. The public will be admitted at two shillings and sixpence to the body, and one shilling to the galleries, of the hall.

TUESDAY, OCTOBER 12.

Half-past Ten, a.m.—The Lord Chancellor of Ireland, the Right Hon. W. F. Cowper, M.P., and the Right Hon. the Earl of Carlisle, K.G., Presidents of the first, second, and third Departments, will deliver Addresses to Members and Associates in the Concert-room, St. George's Hall.

One, p.m.—An excursion to the Akbar Reformatory Frigate. A steamer will leave the Great Landing Stage to convey the Members and Associates on board, returning at three o'clock.

Half-past Three, p.m.—The Right Hon. the Earl of Shaftesbury, and the Right Hon. Sir James Stephen, K.C.B., Presidents of the fourth and fifth Departments, will deliver Addresses to the Members and Associates in the Concert-room, St. George's Hall.

Seven, p.m., to Ten, p.m.—The Liverpool Academy, Old Post Office-place, Church-street, will open its Exhibition of Paintings to Members and Associates, who will be admitted on presenting their tickets.

Quarter to Eight, p.m.—The Philharmonic Society have invited one hundred and fifty of the Members and Associates of the Association (being non-residents in Liverpool) to the Concert in the Society's Hall in Hope-street. Tickets, which will be issued strictly according to priority of application, to be obtained at the Reception-room, St. George's Hall, on either the Monday or Tuesday of the meeting.

Half-past Nine, p.m.—The Mayor has invited the Members and Associates to a Soiree in the Town Hall. Tickets to be obtained in the Reception-room, St. George's Hall.

WEDNESDAY, OCTOBER 13.

Half-past Ten, a.m., to Four, p.m.—The Departments will meet in their respective rooms in St. George's Hall. Papers and Discussions will be taken.

Eight, p.m.—The Authorities of the Queen's College, Mount-street, have invited Members and Associates to be present at an Address to be delivered by Lord Brougham. Tickets may be obtained at the Reception-room, St. George's Hall.

Seven, p.m., to Ten, p.m.—The Liverpool Society of Fine Arts, Queen's hall, Bold-street, will open its Exhibition of Paintings to Members and Associates, who will be admitted on presenting their tickets.

THURSDAY, OCTOBER 14.

Half-past Ten, a.m., to Four, p.m.—The departments will meet in their respective rooms in St. George's Hall. Papers and Discussions will be taken.

Seven, p.m.—The Right Hon. Lord John Russell, M.P., and other Members of the Association, will address a Meeting of the Working Classes. Further particulars will be announced.

Eight, p.m.—Soirée of Members and Associates at St. George's Hall.

FRIDAY, OCTOBER 15.

Half-past Ten, a.m., to Four, p.m.—The departments

will meet in their respective rooms in St. George's Hall. Papers and Discussions will be taken.

Six p.m.—A public dinner will take place at St. George's Hall, Lord Brougham in the chair. Tickets, gentlemen, 21s., ladies, 10s. 6d., may be obtained at the Reception-room, St. George's Hall, or from Mr. Lynn, Waterloo-hotel, on and after Monday, 4th October.

SATURDAY, OCTOBER 16.

Eleven, a.m.—Concluding meeting of Members and Associates in the Concert-room, St. George's Hall. Reports and resolutions.

On Wednesday, the 13th, the Jurisprudence Department will be occupied with a discussion on Bankruptcy Law Amendment, which will be supported by representatives from Chambers of Commerce, Trade Protection Societies, and other public bodies.

On Friday, the 15th, the Social Economy Department will be occupied with a discussion on Coinage, Weights, and Measures, which will be supported by the International Association.

A programme of the papers and other business will be issued daily during the meeting, at the Reception-room, St. George's Hall.

II.—REGULATIONS FOR MEMBERS AND ASSOCIATES.

Any person becomes a member on payment of one guinea as an annual, or of ten guineas as a life subscription. Every member receives a ticket, which admits to all the meetings of the Association, and is entitled to the Transactions free of charge.

Any person becomes an associate for a year on payment of ten shillings. Every Associate receives a ticket which admits to all the meetings of the Association.

The Council invite ladies to enrol themselves as members and associates.

A limited number of tickets, transferable, ten shillings each, will be issued on the application of members only, admitting ladies to reserved seats, at the opening address on Monday evening, and to all the meetings of the Association during the week.

In the book which will be transmitted with the members' and associates' tickets, will be found a list of the principal hotels and the lodgings recommended by the Local Committee. Refreshments will be provided in the Hall.

Members and associates are requested to enter their names, permanent addresses, and, if non-resident in Liverpool, their temporary addresses during the meeting, in the book provided for that purpose at the Reception-room, St. George's Hall.

A post-office for the use of the members and associates will be open at St. George's Hall during the period of the meeting. Letters should be addressed, "National Association, St. George's Hall, Liverpool."

The tickets are now ready, and can be purchased from the Local Secretary, George Melly, Esq., 7, Water-street, or the Local Treasurer, Arch. Briggs, Esq., 7, Walmer-buildings, Water-street, from whom all information can be obtained.

NORTHERN ASSOCIATION OF MECHANICS' INSTITUTES.

The annual conference of this Association was held at Alnwick, on Thursday, the 14th inst., under the presidency of Sir George Grey, M.P. There was a considerable gathering of delegates from all parts of the northern counties, among whom were Mr. Joseph Cowen, junr., of Stella-house, Mr. Ingham, M.P., Dr. Embleton, Beadnell; Mr. Tate, F.G.S., of Alnwick, and other friends of education. Mr. J. L. Thornton, the Secretary to the Association, read the report, which stated that the itinerating library had proved very successful throughout the rural districts; that there was an increase in the

number of societies in connexion with the union; and that the council had arranged a plan for a concerted series of lectures during the season. After the reading of the report, an interesting discussion took place on the subject of classes, in which Mr. Ingham, M.P., Mr. Joseph Cowen, junr., Mr. Tate, and other delegates took part. Mr. Joseph Cowen, junr., gave an interesting account of the successful efforts of the Blaydon Institution to extend popular education among the pitmen, keelmen, and other workmen in that Tyneside village. He also said that at the meeting at Gateshead last year, a proposition was made, he thought by one of the delegates from Gateshead, that, as efficient teachers were not forthcoming at the village societies, some attempt ought to be made to have one teacher for the different societies in the neighbourhood of Newcastle; that he should visit them in turn; and that by the different societies paying him a reasonable remuneration for his services, it would be worth his while to devote his time to the institutions *seriatim*. The institution which he (Mr. Cowen) represented acceded to this proposition, but few societies felt disposed to take it up. His society, however, determined they would do something on their own responsibility; and at the commencement of last winter issued notices of the commencement of classes for instruction in geography, history, and drawing, and he was glad to say that their first meeting for the establishment of these classes was extremely successful. After a week or ten days they were unable to afford accommodation for the number of pupils who attended. They therefore took an old building, previously used as a chapel for Wesleyan Methodists, and converted it into an efficient schoolroom, and there, for five months of last winter, and for five days in the week, they taught regularly a night-school, with complete success. The only difficulty they had was to find accommodation for the number of pupils that attended. They had an average attendance of something like 100, and the results were most satisfactory. He was persuaded that if similar efforts were made in other places, similar results would spring from them. They had had at Blaydon also a very successful experiment in regard to amusements. It was found that lectures on mechanical and philosophical subjects were not successful—that the number attending them was not sufficient to adequately remunerate the lecturer or pay the necessary expenses. They therefore adopted the plan of having some music—vocal and instrumental—and of imparting useful instruction between the pieces. He was very glad to say that this also had been successful, and that during the last winter, for six months, they had, every alternate Saturday night, entertainments of this description, and the average attendance each night was 400 or 500. The amount of good, social, moral, and otherwise, thus done in the village was considerable, and they had determined to commence a similar scheme this winter.

After the adoption of the report, the election of the council, &c., the right hon. chairman distributed the prizes for the best essays, and the conference broke up, to meet at Newcastle next year.

At the dinner, which was held at the Turk's Head, in the afternoon,

Sir GEORGE GREY, in proposing the toast "Prosperity to the Northern Association of Literary and Mechanics' Institutions," said that he could not fail to mention it as a subject of congratulation—that in the age in which we lived it was useless and superfluous to dwell upon the advantages of the diffusion of education and of knowledge. The time was happily gone by when, to use the language of a great writer, "The arrogance of learning could condemn to ignorance the great body of the people." The time was happily gone by, too, when the fears or apprehensions of one class of society could stand in the way or raise a barrier against the enlightenment and education of the great body of another. It was now universally admitted that knowledge is a blessing; and the only question which was discussed, the only thing

upon which debates and difference of opinion arose, was as to the best means of effecting an object the value of which all concurred in. He believed there was nothing more true than a sentence which he found in an appeal lately issued by the council of this association in behalf of their itinerating libraries, soliciting aid for the continuance and extension of them—namely, that it was in vain to expect any marked improvement in the moral and social condition of the people, without affording them the means of intellectual culture and relaxation. This association was doing its utmost to carry out this object; and, therefore, he thought, it was deserving the support, the cordial support, of all who were anxious to promote the best interests of their fellow-countrymen. He most cordially concurred in the view put forward in a passage which was read from the report, in which it was stated that the object was the withdrawing men from the tavern and the alehouse, which would be frequented, in his opinion, whatever prohibitory laws were passed, so long as the tavern and the alehouse were the only resource which the working man had where he found social relaxation and intercourse. The best way to counteract that evil influence which was so much deplored by all, but which he hoped was losing its weight and diminishing in this country, was by establishing something which would be attractive to the working man, and which, while it would amuse and interest him, would also elevate and improve him. He thought the best mode of proceeding was to establish a reading room wherever a reading room could be established, accessible to the working man, comfortably lighted, with a cheerful fire, and with other requisites which were necessary in order to make it attractive; and by so doing they offered him, as a reasonable being, as a being accountable not only to the laws of his country, but accountable to God, enjoyments and objects of interest which, when once appreciated, would withdraw him from those debasing pleasures in which so many, in the absence of other objects of interest, were disposed to indulge. Sir George Grey then proceeded to speak of the advantages of some of the other means which the association employed for effecting the same object,—its lectures, its itinerating libraries, its evening classes and schools, and especially its system of examinations and prizes, which stimulated rising genius, and which were sufficient to induce men to devote their minds and faculties to the attainment of high and useful ends. Returning to the subject of reading-rooms, he thought that a useful and judicious selection of books was most important. He did not mean, by a useful and judicious selection of books, that they should very carefully weed their libraries of everything which the fastidious might think ought not to be there. It was by no means necessary that this should be the mode of dealing with libraries. Let there be books of all kinds in these libraries, but let the selection be a wise and judicious selection, with a view to put in those libraries books which, while they attracted, would also deeply interest, and would excite men to higher motives of action, and would supply them with examples to guide them in their course, in whatever sphere of life they might be placed. Before, however, he adverted to the character of the books which he thought it very desirable should be in these libraries, he wished to say a word on what he saw adverted to in many of the reports with reference to newspapers. He found rather a regret expressed that newspapers formed the principal attraction in the reading-rooms. In some cases, even, it had been thought almost necessary to separate the newspapers from other books, and to have one apartment for the newspapers and another for books, because newspapers diverted people's attention from what was most useful and valuable. For his own part he thought that, looking to the character of the newspapers of the present day—looking at the variety of information which they contained—looking at the ability with which they were written—at their descriptions of facts occurring

in all parts of the world, looking at the reviews of literary works which were found in them, even if newspapers were the only literary food presented in these reading-rooms, he would still advocate the reading-room being open, provided it was confined to newspapers, which it was evidently not desirable it should be; but he would not withdraw the newspapers from those reading-rooms, or attempt to divert men from the perusal of newspapers by excluding them from the room where other works were kept, because he believed that even from newspapers much valuable instruction and information might be gained, especially as they were conducted in the present day; and he would encourage newspapers of a good class, containing, as many now did—even including in that class many of those which were published at the cheap rate of a penny, the latest information and events occurring in Europe, in London, and other distant places on the evening before. These cheap papers were conducted with great ability, and even they would be an admirable substitute for the debasing pleasures—if pleasures they could be called, which were afforded by the tavern and the publichouse. He would for a moment advert to what he saw alluded to in the report,—viz., works of fiction. He saw that a prize was offered for the best essay upon the expediency of admitting or excluding works of fiction from those libraries which were connected with Mechanics' Institutes. No essay had as yet been produced on this subject, and he did not know what view might be taken of it hereafter. The report rather invited opinion on it, and expressed a hope that what had been matter of such difference of opinion, and which had unhappily given rise to some ill-feeling, might be set at rest by the free consideration of it. First of all, he thought it most unfair to authors of works of fiction to class them together as a whole, and to draw a broad line of distinction between works of fiction and those works which were not of fiction. Some works of fiction contained admirable morals; some contained instruction of the highest character, and in a form in which perhaps no other works could convey it; and he thought it would be most injurious to the interests of those connected with those reading-rooms if works of this kind were excluded. He should therefore tender his humble service to the council of this association, if they were called upon to lay down any rule on the subject, not to exclude all works of fiction, because they would thus exclude what was deeply interesting to the great body of readers who frequented reading-rooms, and which would also be calculated to convey to them the highest moral instruction. The wise rule would be to look to the character of the work from its intrinsic merits rather than to draw any arbitrary rule, which he was sure would be most injurious to the interests of those for whose benefit those institutions were intended, and would tend very much to defeat the object which those had in view who were zealous in the promotion of them. It was, however, a subject of great congratulation that we had a number of books published from time to time which were not ephemeral, which were not works of fiction, but which possessed as deep an interest as could be possessed by any works of fiction, while they were calculated in the highest degree to elevate the minds of them who read them. He would refer to some of those which had been published within the last year. He would instance the life of a man they might almost call their own—George Stephenson, a man of whom the North of England might justly be proud. Who was there that could read that "Life of George Stephenson"—looking at his early struggles for knowledge, unaided by any of those advantages which the Mechanics' Institutes in the present day afforded to men similarly circumstanced, labouring to make the best use of that intellect which God had implanted in him—labouring with a success which made him one of the first men in Europe—without feeling the deepest interest in the narrative, and without feeling himself a better man for

an attentive perusal of that work? George Stephenson was a self-educated man, for while he laboured successfully against all disadvantages in cultivating that intellect with which God had endowed him, he did not overlook the immense advantages which the means of high education afford, but he gave his son—the present distinguished man who bore his name, and who also was one of the first men for engineering talent in Europe—gave him the best education which it was in his power to command, showing how much he appreciated those advantages which these institutions set before the mechanic, and how much he valued those means which were now placed within the reach of all for the improvement of their minds and for obtaining that knowledge which was conducive to the highest ends. He would turn from the life of George Stephenson to the life of a man who moved in a totally different sphere, and whom, he was also proud to say, they might claim for the North of England. Who was there who had read any of those short and very interesting memoirs that had lately been published of that great and lamented soldier, General Havelock, who did not feel the deepest interest, who did not acknowledge that there was the highest instruction to be obtained in the perusal of the life of such a man moving altogether in a different sphere, and setting an example which some of them from their different circumstances might think they might not be able to follow, but still acting from a motive which must and ought to influence all—the highest motive which ought to regulate the conduct of men? Then, again, who was there that had read the narrative of the heroic defence of the beleaguered city of Lucknow by the garrison, cut off as they were from all intercourse with their fellow-countrymen, that did not admire the spirit which animated them, and feel himself incited to the highest deeds by reading the matter-of-fact commemoration of their daily trials and their daily exertions? He would mention another book which had only been published very recently, since the last meeting of the association, and which would not, therefore, be generally known; viz.,—"English Hearts and English Hands," written by an English lady, and recording in the most simple terms her experience among a class of men whose rough exterior and demeanour repelled most men—the men employed in making railways—and showing that beneath that rough exterior there was a soul well worthy of cultivation—a generous and noble feeling, only requiring to be called out by kindly intercourse with one who had most nobly devoted herself to their welfare. This book spoke of Englishmen in a way that was of thrilling interest, and conveyed this important lesson, "Go thou and do likewise." They might not all be able to do what she did, but let every one be animated by the same excellent feeling towards their fellow-creatures as she was, and then there would not be wanting the means by which they might benefit them around them, whatever their sphere of influence might be. Sir George Grey then referred to a work by Hugh Miller called "My Schools and Schoolmasters," which gave an early autobiography of that eminent man. That book was one which he had read with the greatest interest, and with feelings of humiliation to think that with all its advantages one had possessed, one fell so far short of what he attained—unaided as he was by those advantages which others more favourably circumstanced enjoyed. He had ventured to allude to those books rather as types of a class of works which, if placed in these libraries, could not fail, he thought—in connection let it be, with works of another kind, with newspapers and the best works of fiction—to attract and interest. People would not read because they were told to read, and because they were told a book was a good book; but if they found a book full of deep interest, full of narrative and facts, and all the more interesting because they were facts, that was the way in which, he was sure, they would get those reading-rooms frequented. They should attract people to them, and thereby carry on a successful

competition against the tavern, the alehouse, and the beershop. In connexion with these reading-rooms he certainly thought it was most important that means should be found for extending the itinerating libraries. There was a great advantage in having a change of books, and if these itinerating libraries—such libraries, he presumed, not always being of the same kind, but varying in the character and description of the books—if these itinerating libraries were sent about to remote villages and hamlets, and were there detained for three months, and then changed for others, the interest, which otherwise would flag, would be kept up. He would now for a moment advert to lectures. He thought that, however good lectures might be, they were not a substitute for reading or a substitute for books, but should only be regarded as a most useful auxiliary. The great object of the lecture was, in his opinion, to lead people to books, not to let them go away satisfied that they had got from the lecture what no lecturer would ever think or dream himself capable of giving them, a thorough knowledge of the subject on which the lecture was given; the great object of the lecture ought to be to excite an interest, to stir up the mind, and to excite that curiosity which was implanted in every man, and which only wanted a right direction. If lectures were so understood, if they were intended to stir up a spirit and taste for reading, then he thought they were in a proper place, and could not be too highly commended. Books, however, it had been observed by M. Guizot, in a recent work of his, in a sentence which was worth remembering, "Books are the tribute from which the world is addressed." Lecturers could only address the few present, confined within the walls in which they lectured, but books circulated among thousands. He therefore, still without undervaluing the advantages of those lectures, attached the greatest importance to the reading-room, to a well-selected library, and to the itinerating libraries. He would just advert to allusions which had been made, towards the conclusion of the report, to the complaint which had been put forward by some, that these Mechanics' Institutions had been failures. In one respect, and to a limited extent, they certainly had not answered the reasonable expectations of those by whom they were first advocated, and by whom they had been supported. There had certainly been an amount of apathy which was hardly expected among the great body of the working-people. They had not shown that interest in Mechanics' Institutions—that desire to avail themselves of their benefits, to the extent that had been hoped and expected would have been the case. At the same time, their growing influence showed that there was an increased appreciation of their benefits among the working classes generally. The friends of education should not be discouraged. Let them do as had been done at that meeting, let every man bring his own suggestions and his own experience into the common fund; and if they found that the result which they anticipated had not been attained to the fullest extent, let them consider whether it was not partly their own fault, and whether they were using the right means,—whether there was not something also which they could do which would tend to remove those obstacles which might have unhappily stood in the way of the complete success of these Institutions. A complaint was sometimes made that the knowledge obtained in them was all superficial, and would do very little good. He would mention the way in which one of the deepest thinkers, perhaps, of modern times, the late Sir James Mackintosh, combated this objection. Though there was hardly any deeper thinker and better informed man than he, yet he ventured to become the advocate of superficial knowledge—not of superficial knowledge as against knowledge of a deeper kind, but superficial knowledge in those who had to choose between what might be termed superficial knowledge and ignorance. The great body of the people could not be profound, but, at the same time, the

great truths which regulated the moral and political relations of men lay not very far below the surface, and it did not require that a man should be a philosopher, that he should go deep into the arcana of science, in order to apprehend those great moral and political truths. Sir James Mackintosh went on to say that the great works in which scientific discoveries were made, and scientific truths stated, were only read by a few; but that the truths which these works contained, pervaded gradually the minds of a reading people—even though that reading might be of a kind that was almost superficial, and, by a variety of almost unseen and circuitous channels, they penetrated everywhere, even to every shop and every hamlet. Let them not, therefore, be discouraged by thinking that all knowledge which by wise men, or rather by very learned men, might be termed superficial, was useless; and let no man abstain from entering upon the path of knowledge, and endeavouring to lead others to do the same, because they might not attain those heights which they might desire, but which circumstances placed beyond their reach. In conclusion, Sir George Grey alluded to the prospect of Examinations being held by the authorities of the University of Cambridge at Newcastle, and dwelt upon the advantages that these and similar Examinations afforded as an encouragement to persevering exertion.

MANUFACTURE FROM THE WASTE OF WOOLLEN MILLS.

A process was recently set in operation at the Kingholm woollen mills, in the neighbourhood of Dumfries, by which the hitherto refuse of the washing houses is converted into valuable commercial material, in place of being turned into the river Nith and adding to the pollution of its waters; and this process exhibits one of the most pleasing and interesting examples of the economical power of chemical science which has yet been seen.

In a woollen manufactory the first thing done is to wash the wool thoroughly. The same thing is done frequently when the wool has been spun into yarn, and always when the yarn has been woven into cloth. Wool in its natural state contains a considerable quantity of grease or animal oil; and it is besides oiled to enable the spinning process to go on properly. Again the soap, which with a little soda forms the only washing materials used at Kingholm besides water, contains a considerable proportion of oil; so that it may be readily seen that the refuse water from the wash-houses is rich in animal matter. To turn this to account an apparatus has been erected at Kingholm, which we will endeavour to describe.

Iron pipes have been laid from each of the washing machines to a tank placed at one side of the wash-house, and the mouth of the pipe which runs from the machines washing wool is covered with perforated zinc plate to prevent any loss of raw material. A small force-pump, driven by the mill engine, lifts up the water collected from the various machines in the tank, and sends it through another series of pipes to a building which has been erected outside the mill and close to the boiler-shed, which at Kingholm is without the mill. The waste water flows into three elevated tanks in the building, which it enters at a temperature of about 120°. Each tank is provided with a small steam pipe from the boiler, and a jet of steam is occasionally introduced so as to bring the soap suds up to the temperature of 160°. When as much washing has been done as to supply sufficient suds to fill one of the tanks, and a proper temperature has been gained, a chemical preparation is poured into the tank, which acts with power upon its contents. The water, before being acted upon, is of a dirty white colour, and about the consistency of cream; gradually, after the acids and other substances have been introduced, a viscid scum rises to the top, while a quantity of matter is pre-

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SOUTH KENSINGTON MUSEUM.

During the week ending 18th Sept., 1858, the visitors have been as follows:—On Monday, Tuesday, and Sunday (free days), 3,783; on Monday and Tuesday (evenings), 5,479. On the three Students' days (admission to the public 6d.), 615; one Students' evening, Wednesday, 127. Total, 10,004. From the opening of the Museum, 602,151.

Home Correspondence.

EXHIBITION OF 1861.

—On Mr. Winkworth's letter on the site of the proposed Exhibition of 1861, I wish to offer a few remarks. He completely ignores that the West-end Railway at Battersea will, before that year, be carried across the river to a terminus at Pimlico, within a quarter of a mile of Buckingham Palace, a spot easily reached by all north-western suburbs. There is no reason why omnibuses should not be established to this new terminus, to Battersea-park at cheap rates, as they were in 1851 to Hyde-park. Omnibus proprietors and cabmen are fully alive to their interest, and would not fail to profit by the stream of visitors that would be drawn to the Exhibition of 1861, wherever it may be established. If they are now wanting at Battersea terminus, Mr. Winkworth has an excellent reason for it, by acknowledging the difficulty of travellers to this terminus at present. There are vast populations in the eastern district of London, besides the mass of inhabitants on the south side of the river, and where steam-boat communication would be the nuisance and delay of threading through the crowded streets of London to Hyde-park. The recollection of 1851 must have proved to the visitors the confusion at times of having only one road to the Exhibition building, whereas Battersea-park will enjoy the advantages of the two rails thither; one from London Bridge, the other by the river side, and one from the new terminus at Pimlico, besides the river steam-boats. On the score of expense, Mr. Winkworth confesses himself uncertain; but that could be overcome, if it exists at all, by the judicious construction of the building, which, be it remembered, is intended solely for an Exhibition during summer months.

I am, &c.,

HENRY MOGFORD.

—I agree with Mr. Winkworth in thinking that an excellent neighbourhood of the old Exhibition of 1851 is the best site for the Exhibition of 1861. Mr. Winkworth has assigned good and valid reasons in favour of South Kensington. The truth, in my opinion, is that advocates of Battersea-fields forget the great North London population, and they further forget that the London and North-Western Railway Company has now of their private stations for materials within half a mile of the Commissioners' land; and I cannot doubt that in 1861 the directors of that company will, without any unusual forethought, make it a line for passenger traffic, thus enabling them to deliver, almost on the very spot of the Exhibition of 1861, exhibitors, goods for exhibition, and visitors from the entire North of England and North-east of London.—Yours, &c.,

A WELL-WISHER TO EXHIBITIONS.

Proceedings of Institutions.

GREENWICH.—J. Angerstein, Esq., of the Woodlands, Chichester, has forwarded to Mr. Cobbett, of Deptford, the munificent donation of £100, to be expended by him on books for the library of Greenwich Literary

Institution, which already consists of between 3,000 and 4,000 volumes. The members of the institution number nearly 1,000.

LONDON MECHANICS' INSTITUTE.—On Wednesday, the 16th inst., the certificates of the Society of Arts, obtained at the late examination by members of the London Mechanics' Institute, were publicly presented to the successful candidates, by Mr. T. A. Reed, Chairman of the Local Board of Examiners. Having given a brief explanation of the manner in which the preliminary and final examinations were conducted, Mr. Reed stated that nine members of the Institution presented themselves for examination by the Local Board, together with three members of other Institutions not having Local Boards of their own. Of these twelve, eight (all members of the London Mechanics' Institution) successfully passed the preliminary ordeal; but six only were able to present themselves for the final examination, one of the candidates having been prevented by illness, and another being a few weeks under the prescribed age. Of the six who were examined, one only was unsuccessful, and the remaining five obtained between them eleven certificates. This result was highly creditable to the candidates themselves and to the Institution in connection with which they had obtained these honourable proofs of their efficiency. It showed that the pulse of the old Institution was still throbbing; that, despite sinister forebodings out of doors, the time had not arrived when they were called upon to write its elegy and wish peace to its ashes. The result of the examination, he trusted, would have the effect of increasing the attachment of the successful candidates to the Institution, and operate as a stimulus to their fellow members to prosecute their studies with the like diligence, that on some future occasion they might meet with the like success. Not, however, that success was an accurate criterion of the value of the examinations; for it was obvious that the course of discipline which a candidate would pass through in order to prepare himself for the ordeal could not be otherwise than beneficial, whatever might be the result of the examination itself. Mr. Reed then intimated that the prize obtained by the Local Board for having sent up so large a proportion of successful candidates would be expended in books to be offered as prizes to some of the elementary classes of the Institute. The following certificates were then presented:—

Arithmetic.—Mr. James Dickie, Second-class Certificate (Proficiency).

Algebra.—Mr. Daniel Leggatt, Second-class Certificate (Proficiency).

Bookkeeping.—Mr. James Dickie, First-class Certificate (Excellence). Mr. William W. Snelling, First-class Certificate (Excellence).

Chemistry.—Mr. Thomas Shinn, Second-class Certificate (Proficiency).

Descriptive Geography.—Mr. James Dickie, First-class Certificate (Excellence). Mr. William W. Snelling, First-class Certificate (Excellence).

English Literature.—Mr. Francis Lynch, Second-class Certificate (Proficiency).

French.—Mr. James Dickie, Second-class Certificate (Proficiency). Mr. Francis Lynch, Third-class Certificate (Competency).

Latin Language.—Mr. Francis Lynch, Third-class Certificate (Competency).

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Sept. 17, 1858.]

Dated 4th August, 1858.

1774. J. B. Pascoe and J. R. Thomas, Chaco-water, Cornwall.—An improved method of and apparatus for feeding boilers of all steam engines with liquid, without the aid of the force pump heretofore used.

- Dated 6th August, 1888.*
1790. C. Barthémy, 27, Bush-lane, London—Certain imp. in hats.
Dated 10th August, 1888.
1826. R. H. Collyer, M.D. and C.E., 3, Park road, Regent's-park—An improved coating composition to protect vessels from marine animal and vegetable substances.
Dated 11th August, 1888.
1824. J. T. Pitman, 67, Gracechurch-street—An improved mode of operating apparatus for lifting and pressing. (A com.)
Dated 20th August, 1888.
1900. A. Baker, 6, Lambeth-road, Southwark—An improved method of and apparatus for submerging or laying under water electric cables, wires, or lines, and for the recovery thereof.
Dated 31st August, 1888.
1950. J. Ireland, Manchester—Imp. in cupola furnaces.
1952. W. Foster, Black Dike Mills, near Bradford—Imp. in the manufacture or production of fabrics known as fancy moreens.
1964. J. D. Brabson, Lane's Hotel, St. Alban's place, Haymarket—Imp. in giving motion by sails to screw and other propellers of ships and vessels.
Dated 30th August, 1888.
1968. E. Massey, Tysoe-street, Clerkenwell—Imp. in ship's logs.
1960. G. Davies, 1, Serle-street, Lincoln's-lane—Imp. in billiard-tables and cues. (A com.)
1964. G. Jones, Bangor Wharf, Pimlico—Securing joints in slate ridge roll.
1966. E. Lindner, New York—Imp. in breech-loading fire-arms and ordnance, and in cartridges.
1968. T. B. Harding, Leeds—Imp. in the method of making straight or circular combs for flax, wool, or silk machinery.
Dated 31st August, 1888.
1970. E. Spary, Queen's Graperies, Park-street, Brighton—Imp. in fumigators.
1972. M. A. F. Mennons, 39, Rue de l'Ecliquier, Paris—Improved apparatus for the elevation of liquids. (A com.)
1974. F. Ayckbourn, Lyon's-inn, Strand—Imp. in the construction of beds and other articles for sitting or reclining upon.
1976. D. Heyworth, Featherstall Mill, Littleborough, Lancashire, and J. Heyworth, Prospect Mill, Hebden-bridge, Yorkshire—Certain imp. in looms for weaving.
1978. A. V. Newton, 66, Chancery-lane—An imp. in gas burners. (A com.)
1979. W. Rose, Hales Owen, Worcestershire—An imp. or imps. in piling or combining metals to be used in the manufacture of arms and cutlery, and for other similar purposes.
1980. A. V. Newton, 66, Chancery-lane—Imp. in air engines. (A com.)
1981. Capt. P. D. Margesson, Woolwich—Imp. in treating sugar canes and other cases containing saccharine matter in the preparation of food for animals, also in manufacturing sugar, and worts, or wash, for brewing, distilling, and vinegar making, and in applying the resulting fibre in the manufacture of paper.
Dated 1st September, 1888.
1982. W. Parsall, 22, Whitall-street, Birmingham—Imp. in the manufacture of percussion caps.
1983. W. Phelps, Red Lion-square—Imp. in wet gas meters. (A com.)
1984. W. Hobbs, 196, Piccadilly—Imp. in ordnance and warlike projectiles to be used therewith.
1985. J. Sloper, 215, Oxford-street—Improved means of and apparatus for indelibly crossing or marking bankers' cheques, drafts, documents, or other things, with a view of preventing erasures or fraudulent dealings therewith.
1986. H. C. Jennings, 8, Great Tower-street—Imp. in the manufacture of artificial parchment, and converting the same into leather.
1987. W. Warner, Tottenham—Imp. in the construction of elastic pavements and linings for walls, and in the manufacture of elastic mats, brushes, and pads for packing furniture.
1989. W. B. Newton, 66, Chancery-lane—Imp. in the construction of locks for doors, safes, and other purposes. (A com.)
1990. W. B. Newton, 66, Chancery-lane—Imp. in springs for carriages and other purposes. (A com.)
1991. S. Laing, Mill Wall—Imp. in the apparatus employed in the manufacture of gas.
Dated 2nd September, 1888.
1992. J. Walker and J. Barnes, Oakenhaw, Lancashire—Imp. in blankets and lappings for machine and block printing and other similar purposes.
1993. G. Price and W. Dawes, Wolverhampton—Imp. in steam-engines, steam boilers, and apparatus connected therewith.
1995. J. T. Pitman, 67, Gracechurch-street—An imp. or imps. in the construction of pneumatic condensing apparatus, for the purpose of compressing air, aeriform or gaseous bodies, preparatory to their use as prime movers, or for other purposes. (A com.)
1996. B. Winstone, 100, Shoe-lane—An imp. in the composition of copying and writing inks.
Dated 3rd September, 1888.
1907. J. M. Ballanger, 41, Rue de Tréville, Paris—Caoutchouc soles or clogs, with springs and without bridges.
1908. J. Robertson, Glasgow—Imp. in driving belts and springs.
1909. W. Harker, Lostock Gralam, Cheshire—An improved plough and pulveriser.
2000. E. Cooker, Newton Heath, near Manchester—Imp. or imps. in machinery for spinning, twisting, or doubling cotton, flax, silk, wool, or other fibrous materials.
2001. G. T. Beauchamp, Loughborough-park, Brixton—Imp. in knitting machinery. (A com.)
2002. R. A. Brooman, 166, Fleet street—An improved apparatus for supporting the skirts of ladies' dresses. (A com.)
Dated 4th September, 1888.
2003. A. Guye, Clerkenwell—Imp. in the escapements of chronometers and watches.
2004. R. P. Lavie, Paris—Imp. in mills.
2005. R. A. Brooman, 166, Fleet-street—Improved apparatus for receiving, containing, and delivering liquids. (A com.)
2006. W. H. Child, Providence-row, Middlesex—Imp. in hair and skin brushes.
2007. W. P. Pigott, 16, Argyle-street, Regent-street, and 8, Bondmore, 37, Upper Berkeley-street—Imp. in viscous and fermented liquors.
2009. A. V. Newton, 66, Chancery-lane—An imp. in firearms. (A com.)
2010. H. Hyde, Truro, Nova Scotia—Imp. in the construction of carriage-springs. (A com.)
2011. A. Hills, Blackheath, Kent—A method or methods for the better securing the integrity or genuineness of bank cheques or orders for money.
Dated 6th September, 1888.
2013. S. Hoga, 14, Nassau-street, Middlesex-hospital, W. P. Pigott, 16, Argyle-street, Regent-street, and 8, Bondmore, 37, Upper Berkeley-street—Imp. in submarine electric telegraphs.
2015. J. Ramebottom, Accrington, and T. Watson, Baxenden, Lancashire—Imp. in machinery or apparatus for weaving.
2017. H. J. Distin, 9, Great Newport-street, Leicester-square—Imp. in cornets and other musical wind instruments.
Dated 7th September, 1888.
2019. W. S. Champness, 10, Osborne-terrace, Clapham-road, Surrey—Imp. in syringes for male and female use.
2021. E. Fullwood, Queen-square, Bristol—Imp. in the manufacture of cements.

INVENTIONS WITH COMPLETE SPECIFICATION FILES.
2083. J. Luis, 12, Walbeck-street, Cavendish-square—A new system of moulding without foundry pattern. (A com.)—1st September.

WEEKLY LIST OF PATENTS SEALED.
September 17th.
538. W. S. Clark.
541. W. Todd and J. Todd.
547. R. A. Brooman.
550. L. E. Fletcher.
554. A. Dunlop and A. Stark.
556. T. Sumfield.
563. P. F. Aerts.
564. H. Broeklebank.
565. G. Scott.
573. J. Yeung.
574. J. Bramwell.
581. R. Mills.
586. J. Le Franc.
589. J. T. Pitman.
592. J. Thomas.
597. I. Holden and E. Hubner.
615. C. Chevallier, M. L. Olivier, and E. Rolland.
620. G. A. Biddell and W. Balk.
626. D. A. Hopkins.
628. J. Nuttall.
632. F. Foucaud.
652. W. T. Eley.
658. W. Garnett, C. Geldart, and J. Dugdale.
662. J. Horton.
680. J. Managava.
698. W. E. Newton.
706. A. Palen.
800. W. E. Newton.
832. J. Luis.
944. B. L. A. Passenheim.
945. E. T. Hughes.
1416. C. Vero and J. Ewart.
1429. Sir J. Paxton, M.P.
1452. J. Luis.
1523. J. D. Weston.
1542. M. A. F. Mennons.

PATENTS ON WHICH THE STAMP DUTY OF £40 HAS BEEN PAID.
September 13th.
2070. J. H. Tuck.
2085. W. Sangster.
2091. J. Gray.
September 14th.
2088. D. Zenner.
2099. L. D. B. Gordon.
September 16th.
2102. R. A. Brooman.
September 17th.
2106. R. A. Brooman.
2113. G. A. Biddell.
2166. J. Good.
September 18th.
2119. J. Page and W. Roberts.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4118	Sept. 15.	Improved Hall Lamp	T. Patstone	{ 8, Icknield-square, Monument-lane, Birmingham.
4119	„ 20.	Root Slicer and Cutter	S. Robb and J. Wandy	

Oatwell, Cambridgeshire.

Journal of the Society of Arts.

FRIDAY, OCTOBER 1, 1858.

ECONOMIC USES OF NUTS AND SEEDS.

By P. L. SIMMONDS.

anyone who passes through the bazaars and arcades, notices the shop-windows of the metropolis, cannot have been struck with the many new and ornamental applications of nuts and seeds which have come into use late years, and which are greatly on the increase. There is yet, however, a very wide field open in the extensive productions of nature for profitable industry. The applications of cameo and pearl shells to ornamental studs, sleeve-links, breast-pins, &c., for pretty boxes of bijouterie, or use for the boudoir and drawing-table, and the large sale for such fancy articles, is that a rich mine for the manufacturer and trader been opened up. The fish-scale ornaments, from hard transparent scales of the callipeva and other first brought under notice by Chief-Justice Temple, the columns of the Society's Journal, have now become recognised trade, and brooches, bracelets, tiaras, &c., all of them, are largely vended in the galleries of the Crystal Palace. The turner, again, has profited largely of the extensive introduction of the vegetable ivory and shell nuts, which are applied to a great variety of useful and ornamental purposes.

In endeavouring to add to my private collection of industrial products the various applications which from time to time come before the public, I have been particularly struck with the new uses of nuts, seeds, &c., and as to form, perhaps, one of the most compact, ornamental, and popularly interesting sections of a museum, possibly never collected notes respecting them may be useful.

In the great extension of this branch of trade we have the evidences of the utility of public exhibitions and economic or trade museums, as opening up suggestions and pointing out new materials to work upon. Our continental neighbours seem to be more ready and ingenious than ourselves in the application of nuts, seeds, and such small articles, to the purposes of decoration, and although, from their very cheapness, many of these ornaments are despised by our belles, yet none can deny their interest and utility, and the taste in which they are worked up. The field is an exhaustless one, and many well-known ornamental nuts and seeds of India and South America have not yet made their appearance in this country. The most common applications of seeds and nuts at present are the betel nut, Job's tears, Mimosa seeds, the seeds of the wild liquorice, the Nicker seeds or Bonduc nuts, vegetable ivory, and coquills nuts, &c.

The betel nut, the fruit of the *Areca Catechu* palm, comes with us its famous Eastern reputation as the popular narcotic masticatory. There the nut is sliced and used with pan, or the leaf of the betel pepper (*Piper betle*) and chunam, or shell-lime. The lime gives a deep orange or red colour to the colouring matter of the nut, and thus dyes the lips and tongue in the vulgar manner so common among the natives of India. All classes, male and female, chew it; and they allege that it strengthens the stomach, sweetens the breath, and preserves the teeth. In this country betel nut charcoal is often vended now by chemists as a tooth powder, but the imports of the nut being small, I very much question whether the greater part of that sold is really the produce of the betel nut. But it is the ornamental application of the nut with which I have here to deal.

The fruit (a nut) is yellow, oval, the size of an egg, enclosing an oily kernel, like a nutmeg, conical, rounded, ribbed, and marked with white and reddish veins.

When the outer coat is removed, these veins, or markings, have a very ornamental appearance. The nuts are either turned of a round shape, like beads, with striated lines, or flat, with ridges, like the petals of a flower, set with steel centre ornaments, and small intervening beads of the nut, and thus strung they form bracelets. In the Kew Museum there is a large walking-stick made of sliced betel nuts, fixed on a wire or centre.

A still more ornamental seed used for bracelets and rosaries, is the spherical corrugated seed of the *Elaeocarpus ganitrus*, which are generally admired. In India they are known as Brahmin's beads, and when capped with silver they make very pretty ornaments.

The small round black seed of the Indian shot (*Canna Indica*) are often threaded as beads. But there is another use for them, and that is as a coffee substitute. Another round black seed, of a larger size is the kernel of the fruit of the *Sopidus Saponaria* (Linn.), of *S. marginatus* (Vahl), and other species, which is much used now for rosaries, necklaces, bracelets, and other ornaments. It is popularly known as the soap berry, for the aril which surrounds the seeds is used as soap in South America and India. The capsules or seed vessels are very acid; they lather freely in water, and will cleanse more linen than sixty times their weight of soap; but in time, it is said, they corrode or burn the linen. This, however, requires confirmation.

The legumes of *Acacia concinna* (*Mimosa saponaria*, Roxburgh), form a considerable article of commerce in India. *Mimosa abstergens* fetches in the bazaars there about 1d. a pound, and if powdered 2d. a pound.

The Saponaceous principle, "Saponine," exists in many other seeds and roots, &c., as in the root of *Vaccaria vulgaris*, *Agrostemma Githago*, *Anigallus arvensis*, *Gypsophila Struthium* (the Egyptian soap root), various species of *Dianthus* and *Lychnis*, in the bark of *Quilisia saponaria* and *Silene inflata*.

The soap nuts are exceedingly hard and tough, and take a fine polish. The kernels of the small black nuts of *S. saponaria* are eaten in the West Indies, and deemed as palatable as the hazel nut or almond.

Dr. Sherwood mentions that the seeds of *S. marginatus* pounded with water, often put an end to the epileptic paroxysms, a small quantity being put into the patient's mouth.

The red seeds of the *Adenanthera pavonina*, a tree of the Mimosa tribe, often called red sandal wood in India, are much used for ornaments, weighing almost uniformly four grains; they are very generally employed by jewelers in the East as weights, so are the beautiful seeds of the wild liquorice (the *Abrus precatorius*), which are small bright red peas with a black spot. In India they are called goonch; very pretty rosaries, bracelets, and other trinkets are made of them.

The large seeds of the necklace tree of the West Indies (*Ormosia coccinea*, and *dasycarpa*), of a brilliant red hue, with a black spot at one end, are now beginning to be used for sleeve-links and shirt studs. The Barricari seeds of Demerara (*Erythrina corallodendron*), a member of the kidney bean group, are also an ornamental seed.

The nuts of *Putranyia Rozburghii*, called in Hindostan Jeapootra, are strung by the natives round the necks of their children as an amulet to keep them in health.

The grey bead-like seed known under the popular name of Job's tears, are the stony fruit of a graminaceous plant (*Obiz lachryma*). They are chiefly used in Catholic countries as beads for rosaries, but in times of scarcity they have served as food. They are also valued for some supposed medicinal qualities.

The large, bony, shining, grey, nearly globose seeds (*Guilandina Bonduc*, and *G. Bonducella*), called Nicker beans or Bonduc nuts, are used for bracelets and rosaries, and are very ornamental when set. They are very bitter, and have some medicinal properties, being considered emetic, and are used as a remedy for dropsy. The kernels of *G. Bonducella* are supposed by the native

practitioners of India to possess powerful tonic virtues, and are esteemed as a febrifuge.

Cherry stones, and other fruit kernels, are often seen carved and highly ornamented, made into rosaries, &c., evidencing the patience and skill of the workman who has laboured on them.

The small brown seeds, something like apple pips, so commonly used, when strung thickly together, for bracelets, work-bags, nets for the hair, and other ornamental work, are the produce of *Desmanthus virgatus*. They are frequently dyed black for effect.

Cloves, threaded and interspersed with beads, are also used for bracelets, and are made into a variety of ornamental work, baskets, boxes, &c.

The vegetable ivory nut, sometimes called Corozo, the fruit of a South American palm, the *Phytelephas macrocarpa*, Ruiz and Pav., is now largely imported, sometimes to the extent of 150 tons a year, and they have been sold at the brokers' sales at 8s. or 10s. a thousand, but they fetch now about 40s. a thousand. They come chiefly from the Magdalena river. The applications of the nut under the hands of the turner are most varied. Umbrella knobs, the reels of spindles, pincushions, children's rings, small humming tops, thimbles, cases, and a variety of toys and little knick-knacks being made from it. The interior or albumen of the kernel is as white and almost as hard as ivory, and is in great demand for turning. It is of the same nature, though not of the same consistence, as the flour of the cereal grains, the aromatic substance of the nutmeg, and the pulp of the cocoa nut, which in other palms becomes more hardened. That of the date palm is quite as hard, if not harder, but it is neither large enough nor white enough to be of use to the turner.

The Coquilla nut is the popular and commercial name for the fruit of the *Attalea funifera* palm of Martius. Being excessively hard, beautifully mottled with dark and light brown, and capable of taking a very high polish, they are extensively used by turners for making the handles of bell-pulls, napkin-rings, the knobs of walking sticks and umbrellas, humming-tops, rosary cases, and such like. Several hundred thousand of these nuts are imported annually from Brazil, and sold at about 30s. the mille. The principal use of these nuts now is for waistcoat buttons, which are largely used at Birmingham, and they are coloured different tints to suit different cloths. The palm which bears these nuts also furnishes the strong plaiasam fibre of commerce, so largely used in making brushes and street-sweeping machines. The seeds of many of these palms are eaten by the natives of the countries in which they grow.

The seeds of the shreetaly or talipot palm (*Corypha umbraculifera*) are a species of vegetable ivory, capable of being turned into marbles or beads, and cut into button moulds, draughtmen, &c. They could be obtained in large quantities in Canara and other parts of India, but have not been introduced into England. A kind of flour is obtained from the nut. Another pretty palm nut is that of the Macaw (*Acrocomia sclerocarpa*, Mart). It is often turned and carved into small ornaments abroad. I have finger rings, sailors' rings for their neck ties, and other small articles made from them. On removing the outer coat, the nut has a beautiful black hue, which takes a fine polish, but they are too small to be commercially useful.

The uses of the coco-nut shells, from their familiarity, are now less appreciated. But we still see them carved and polished on the exterior and made into baskets and spoons, or mounted in silver as drinking goblets. They are also used for cups, elegantly carved sugar basins, lamps, skimmers, and by the Polynesians, as well as other natives, entire, for containing their water, having two holes in the summit. The largest nuts are chosen for this purpose, and are often seen highly polished, and of a fine black colour. The shells will also make good lamp-black, and, reduced to charcoal and pulverised, an excellent

dentrifice. They are manufactured into beads for rosaries. The common ladle used over a great part of India and in the Brazils is formed of part of the shell to which a long wooden handle is fixed. Particular virtues have been attributed to cups made of the shell of the coco-nut. They have been supposed to give an ant-apopleptic quality to intoxicating liquors.

The double cocoa-nut (*Lodoicea sechellarum*) of Labillardiere, was once held in great repute for all sorts of fanciful properties, from the ignorance which prevailed respecting its origin. The great men of the East formed of the shell precious vessels, cutting off a transverse slice which constituted the lid, and in this they put their tobacco, betel lime, and whatever else they masticated, believing that these articles could never be contaminated by anything noxious. Water kept in it was considered to preserve those who drank of it from every complaint. The discovery of the Seychillio Islands, and the knowledge thence derived that these nuts grew upon trees, and other coco-nuts, soon reduced their value, and now probably, by the East Indians as by the Europeans, they are only sought as a matter of curiosity, or for domestic purposes.

"Of the nut are made vessels of different forms and uses. When preserved whole, and perforated in one of two places, the shell serves to carry water, and two of them are suspended from opposite ends of a stick. Some of these nuts hold six or eight pints. If divided into two between the lobes, each portion serves, according to its size and shape, for plates and dishes, or drinking-cups, these being valuable from their great strength and durability, so that this kind of utensil, in the Seychillio Islands, bears the name of *vaicelli de l'Isle Franche*. Amongst other articles, shaving-dishes, black, beautifully polished, carved, and set in silver, are made from them."—*Seaman's Palms*.

The stony seeds of the Tucuma palm (*Astrocaryum Tucuma*, Mart.), are in Brazil turned into rings, "bim" or knitting pins, and other small articles for which they are employed. The seeds are so hard that it is almost impossible to break them, except by a powerful blow with a large hammer. The kernel (albumen) is also very hard, nearly approaching to vegetable ivory. The kernel of the fruit of the doom palm is turned into beads for rosaries.

Several kinds of hard brown beans have lately been brought into use for making bracelets and other ornaments. Their plainness and monotony is varied by gold or steel studs and settings, and small beads interspersed with ornamental pendants. The large horse-eye bead, the seed of a species of *Mucuna*, is really ornamental, and curious when mounted for bracelets. The large broad sword beans of *Entada Gigalobium* and *E. Paraceti* are made into spoons, small coin cases, scent bottles, &c. They are used by the natives of India, under the name of "Gel," with soap berries for washing their hair.

The seeds of the pod of the Carob tree (*Ceratonia siliqua*), are said to be the original carat weights of jewellers. It is strange that these seeds, and those of the tamarind, date, &c., have not been applied to some economic use with us.

The locust pods or carob beans, as they are termed, have come largely into use as a cattle food in this country, although they were first introduced at a high price to the chemists' shops as an improver of the voice. You have been assured that like the sweets recommended in the extempore doggerel of a well-known and popular itinerant vendor, they would—

"Clear your voice, and make you sing as well,
As notes of music, or the nightingale."

In the Portuguese settlement of Ambre, Africa, the seeds of the custard apple are strung upon thread as necklaces, and in the Kew Museum are rosaries made of olive seeds and stones. Immature oranges, turned and polished, make very pretty rosaries, having a pleasant

clour, and they are also sold in chemist's shops as "issue peas."

Walnut shells are frequently mounted with hinges, &c., and used as the ornamental cases for miniature articles, such as scissors, thimbles, &c., and the Limerick gloves are packed in them, while jewels and other presents are often disguised in this rough case as an agreeable surprise. Calabashes, the hard rind or covering of the fruit of the *Crescentia Cujete*, are used for all kinds of domestic utensils in Africa and the West Indies. Cups and saucers, baskets and bowls, pepper and salt dishes, &c., of various sizes, plain or carved and ornamented, take the place of crockery, and are not so easily broken or destroyed. I have them in my collection in all sizes and styles. Many will stand the fire for cooking as well as an iron pot.

Under the name of bottle-gourds the hard and rough rind of the fruit of the *Lagenaria vulgaris*, cleared of the pulp and seeds, is used like the calabash for ready-made bowls and vessels for holding water. Snuff-boxes, again, are made by the Africans of *Oncoba spinosa* in Natal and Zambou.

Having touched upon their purely ornamental applications, I may have a few words to say in a future number upon the edible uses of some of the ordinary nuts and seeds, and others that have been less generally utilized.

8, Winchester-street, Pimlico, Sept. 28.

BRITISH ASSOCIATION, LEEDS, 1858.

TRADE AND COMMERCE.

The following paper on "Trade and Commerce, the Auxiliaries of Civilisation and Commerce," by Mr. Bazley, of Manchester, was read before the Section of Economic Science and Statistics, on Thursday, the 23rd ult.:-

Now, as of old, industry is the source whence proceed the supplies of the innumerable products of nature and of manufacturing art. The present age is distinguished not only by an amazing increase in the articles which result from the cultivation of the earth, and from the skill of the artisan, but new powers of production having been discovered, augmented supplies of all things necessary to the existence of the human family as well as of those things which adorn and gratify, yield their comforts and embellishments, and have consequently called for a correspondingly extended distribution. Happily these beneficial agents—production and distribution—have co-existently contributed to the visible and valuable results of modern industry, and this therefore is a pre-eminently practical age. Philosophers, theorists, and inventors have been prolific indicators of improvements; but till Watt and his successors combined the principles of science with the skill of the artisan, and demonstrated by the subjugation of manufacturing difficulties, and by the contrivance of mechanical agents, which became working benefactors, the fruits of scientific knowledge were only first sparingly partaken of. Stores of learning and of science have smouldered in the libraries of their possessors, great multitudes of people in every country have been subjected to the darkening influences of ignorance, though, in slow and uncertain progress, the elements of a new development were advancing; and the test of practical utility thus determines the merit of philosophic propositions, whilst the emanations of the untaught, whose experience as apt workmen has led them to invent and improve, are perfected by the superior application of mental skill, guided by true and enduring principles. Domestic and mere hand labours were the burthens borne alike in every large community, and in the households of the rustic cottage, or of the stately mansion—the distaff and spindle producing home-spun woollen or flaxen yarns; the shuttle with the hand loom and the knitting needle being the implements employed to supply the clothing wants of every family.

About the middle of the eighteenth century, however, the whisperings of intelligence began to tell of magic wonders which water and steam power—with manufacturing appliances to arise from new mechanical contrivances—should produce, and then opened that remarkable era which called coals and metals from the mines to minister to the formation of a gigantic manufacturing system, when domestic industry was proved to be inadequate to provide for those new wants which increased knowledge and refined desires showed their possessors that they required, and which might be gratified with benefit to extending industry. Manufacturing establishments became signs of progress; employment and consumption equally increased; migrations of labourers to districts needing additional hands took place; wages were more extensively paid; expenditure from enlarged earnings fructified by fostering new demands for the necessities of life, thereby widening the foundation on which the new structure of industry should be erected; and the application of mechanical power having led to a vast increase in all the productions which could contribute to the comforts of life, machinery was proved to be creative, and not destructive, of beneficial labour. The rise and progress of the cotton trade will probably best confirm and support these views, which are indeed applicable to every branch of national industry. The growth of cotton is indigenous in those countries which border on the tropical regions. From time immemorial cotton has been grown and manufactured in the East Indies; and no doubt 3,000 years ago the Hindoo wore garments made from this material, not dissimilar to the cotton clothing now supplied from places then unknown, and where the cotton plant cannot thrive, but which industry and machinery have rendered practically the home of this greatest of modern occupations. Asia and Africa were the earliest fields whence cotton was gathered, and though Turkey in Europe, Spain, the Isles of Greece, and the south of Italy, have in the middle ages grown cotton, for the United States of America was reserved its latest introduction, most extended cultivation, and vastly the largest production. Some 70 years ago the seed of cotton was first imported into America, and sown, and when its planter beheld with delight his few acres of ground white with their downy harvest, he exclaimed with foreboding alarm, "This cotton may be made into more stockings than the world needs," yet its value would not exceed £100; whilst, since then, in the very short period of its production in that country, so amazing had been its increase, that £40,000,000 sterling may be estimated as the worth of the last year's yield. Probably from the most remote ages, the arts of spinning and weaving were practised by the human hand. In patriarchal times needlework was highly esteemed, and in every subsequent period this useful accomplishment has been possessed by women of the highest rank, and by those resident in courts, as also by the squaw of the rude Indian, and by the housewife of every country. But to modern efforts must be attributed, as exemplified in the cotton trade, those enormously large productions of the textile fabrics, whether of the plain and useful, or of the fanciful and ornamental which have placed alike in cottages and palaces comforts and decorations to which the ancients were strangers. In 1758 the imports of cotton and its consumption by domestic labour might be three millions of pounds weight for the entire year, but in the present year, a century afterwards, the quantity consumed will be one thousand millions of pounds, of which the United States supplies three-fifths, the other two fifths being obtained from the East Indies, South America, Egypt, and the West Indies. For the last year, by the return made by the Board of Trade, the exports of cotton manufactures, sent to every part of the world, amounted to upwards of £29,000,000 sterling; hence this large sum becomes the agent of payment to a corresponding extent for imports, but in thus largely aiding in procuring increased

supplies of foreign products, whether in gold, silver, raw materiale, food, wines, sugar, fruits, or luxuries of distant growth, which are received into the United Kingdom, there is the satisfaction that our cotton industry has contributed clothing comforts to the benefit alike of the savage and civilised in every region of the earth. In this current year the exports of cotton manufactures will perhaps amount to £40,000,000 value, and the portion left for home consumption may be £24,000,000, or equal to 17s. per head for the population of this country; but as the cotton trade of Great Britain is not half its magnitude in the entire world, including the domestic and semi-domestic manufacture, still extensively carried on in the East, the manufacture of the world at large cannot be less than the annual value of £140,000,000, and therefore this industry affords to the world's population three shillings worth each of cotton clothing, or represented in calico 14 yards per annum for every man, woman, and child in existence. Presuming the cotton industry of this country to amount to £64,000,000 in value for the current year, and the cost of the raw material to be £24,000,000, then the sum remaining for wages, interest of capital, rent, taxes, fuel, freight, carriage and other requisites, will be £40,000,000. The population employed in this trade exceed half-a million, and as every worker is said to be connected in his family with three non-workers, who depend upon the single worker for subsistence, two millions of people are therefore supported by it. Engineers, founders, machine makers, and other auxiliary traders employ vast numbers of well paid-workmen, who are constantly engaged and sustained at the cost of capital invested in the constructive department of the cotton trade; hence these further sources of support increase the total number of people dependent upon this extraordinary industry. But those mechanical artisans who are not directly visible as spinners and weavers, and whose labours cannot be measured by the immediate production of yarn and cloth, are essentially contributing services of greater importance than either; and as capital accumulated by the trade itself, and derived from other channels, has been constantly and progressively in the course of investment, the employment and consequent expenditure of that capital in wages cannot be overlooked, although it does not appear to be recorded in the form of exported or of home-consumed manufactures. Compared with the world's history, the cotton trade may be regarded as having only existed during a mere atom of time. The inventor of attenuating cotton by rollers, whether Wyatt or Arkwright is unknown, but the latter took out a patent for it, and for spinning upon the throstle, in 1767. Hargreaves, who invented the jenny by which the attenuation was effected only by elongation and recession, matured his machine about the same time, and the talented Crompton, whose contribution to the mule gave the greatest impulse to the trade, and whose invention now fills its vast factories, only effected the alliance of the throstle with the jenny in 1787, when he completed that machine of immense merit, giving mechanical life to the laborious and beneficial mule, which then entered upon its successful and profitable career. The total number of cotton spinning spindles in the United Kingdom may be now 30 millions, and in addition there are power-loom and other machines in very great numbers, thus warranting an assumption that 50 millions sterling have been invested in the machinery and buildings of this trade in this country alone; and if the capital of the auxiliary trades, as well as that requisite for carrying on this industry, be included, the total capital employed will exceed £100,000,000 sterling. If, however, Watt had not improved the steam-engine, and developed the dormant usefulness of mere vapour, a serious barrier to the progress of industry, aided by mechanical inventions, would have remained as a retarding obstacle; but in 1774 he was called from Scotland to Birmingham, where he began the construction of that

engine which his partner, Boulton, told George III. produced the object of the love of kings—power. And as it to feed this infant industry, at this period cotton was first grown in the United States and thence supplied simultaneously when Crompton's triumphant discovery appeared. Viewing Lancashire as the chief seat of this industry, if we refer to the population of this county 100 years ago, we find it to have been about 300,000, whilst now it numbers 2,000,000 more, or 2,300,000, making an increase greatly in excess of any of the old trading and agricultural communities of this or of any other country. The individuals who migrated into this country did not leave behind them happier and better homes than they obtained by the change; they did not vacate places of greater profit; and they did not move from their old and parental abodes to accept from those who were establishing a new industry, either fewer comforts or lower wages than they had previously enjoyed. With the new trade of Lancashire, Liverpool became the port for the reception of its raw material and mercantile returns, and for the distribution of the superabundant goods which were produced, and thence shipped to every opening foreign market. Liverpool, in 1768, was little more than a bathing and fishing station; its tonnage then might be 100,000; but, having grown with the growth of the cotton trade, its tonnage for the current year may be stated at 5,000,000. The splendour of the docks, filled with ships loading and unloading, of the public buildings, and of the town itself, proclaims Liverpool to be a seaport of no secondary importance; and its attributes establish it as a representative of a vast industry, and the commercial purveyor of necessities and comforts for great numbers of mankind at home and abroad. Camden relates that the southern and western parts of Lancashire were once a morass, without roads and facilities of communication; its agricultural condition generally being unproductive, the abodes of the labourers were miserable, and, in addition to great natural disadvantages, an expiring feudal system left the people as degraded as they were wretched. This county now, however, is filled with flourishing towns; it is intersected by roads, canals, and railways; its rivers have the safe conduct of bridges; its soil is cultivated alike to the advantage of its owners and to the teeming population which obtain a portion of their food from it: and its abundant mines supply that indispensable fuel which gives power to the modern engine of propulsion, and thence to the spindle and to the loom; to the locomotive; to the proud steamer which defies wind and wave; and which also warms the hearths of all. Manchester, as the chief manufacturing city of this county, has advanced in the full ratio of its increasing industry, with Liverpool and the other portions of the county. In 1768 the population of Manchester and its suburbs did not number 20,000, whilst 600,000 will at the present moment be no incorrect estimate; and this single fact must prove the potency of mechanical skill and the success of manufacturing and mercantile energy there exerted. Extensive are the ramifications of the manufacture of cotton, and numerous are the places in which it has become the great support of labour. In addition to Lancashire, Cheshire, and Derbyshire, where large spinning and manufacturing concerns exist, there has been established in Scotland a branch of the trade of great importance; and in that portion of the United Kingdom the investments of capital are considerable, and the trade there affords profitable employment to multitudes of workpeople in almost every department of its industry. From north to south and from east to west in Great Britain are to be found seats of this manufacture. In many parts of Yorkshire cotton is spun; but in Bradford and other places cotton yarns and thread are extensively and advantageously blended with the wool of the sheep and of the alpaca, jointly producing most useful and beautiful fabrics. At Nottingham the lace trade has taken up its abode, whence it extends to Devonshire and to the Isle of Wight. Leicestershire possesses the

hosiery trade; and thus from place to place cotton has wandered, as a benefactor and not as a vagrant, and has been manipulated according to the genius of the people who have seized hold of it, and to the demands and taste of the age. The beautiful art of printing calicoes and muslins is chiefly conducted in Lancashire, but in Scotland it is also a large and important branch of industry. About one-eighth of the cotton spun and manufactured in the United Kingdom is devoted to this portion of the trade. The workpeople employed in printing are very numerous, and are exceedingly well paid. To the art of printing the cotton trade and the consumers of its manufactures are greatly indebted. No goods produced combine the beauty of coloured decoration with excellence of fabric, at so small a cost, as do printed cottons. Depending, as this country now does, upon cotton as an article by which labour and capital are most extensively sustained, as the leading commodity of import and of export, as affording more employment than any other material of manufacture, having involved in it the welfare and happiness of greater numbers than any other single industry, and contributing by the payment of direct and indirect taxes most essentially to the national revenue—may not the question be asked whether this foreign raw material be so efficiently supplied as to prevent those fearful disasters which would arise to the labouring, trading, and mercantile classes, if by storm or tempest, by revolt, or by the calamity of war, this vital element of prosperity could not continue to be procured from its present field of greatest growth? To the energy of the planters of the United States this industry is more indebted than to the cultivators of land in any other country; yet the States possess only an insignificant portion of ground capable of growing cotton as compared with the vast tracts of excellent soil in suitable climates which are under the dominion of this country. Beyond the possessions of Great Britain are equally extensive fields in which cotton could be cultivated and produced. Africa and Asia could grow more cotton than the most sanguine can contemplate the demand of the whole world will ever require, and to extend its production in those two quarters of the globe would be at the same time to extend civilisation, and to diffuse the comforts of life. Workpeople, manufacturers, merchants, statesmen, and philanthropists, have all the deepest interest in this vital question, but which hitherto has been shrouded in almost fatal apathy. Cotton, sheep's wool, flax, and silk are alike required in larger quantities to supply the calls of industry, and to contribute to the manufacture of goods for which the wants of mankind induce them to crave; and a true benefactor to industry will be he who promotes the growth of those raw materials, without an increase of which trade and commerce will languish; but in truth their scarcity and consequent dearness of price will define and limit the extent of manufacturing industry in every branch; therefore, a great duty devolves upon all who wish prosperity to be perpetuated, and who desire the continuance of well-rewarded labour. At home and abroad the wonder is that the British East and West Indies have not supplied the largest portion of the cotton needed in this country; but the lust of conquest in the rulers of the former dependency, and the prostrate condition of its population, arising from exactions which even few conquered nations have submitted to, have tended to retard the extension of the cultivation of cotton, and of other valuable products such as its soil and climate would permit to be cultivated with advantage; and in the latter, the West India Islands, deadly protection misdirected the energies of their planters, and when the legislature emancipated the negro no provision was made for the introduction of free labour; wherefore misgovernment is responsible for much of the unproductiveness of those portions of the British empire. Roused, however, by the salutary influences of public opinion, the Legislature of our country has given to the East Indies a new existence. No intermediate spoiler will hereafter prevent the Queen

and a direct executive from developing the resources of India. Abounding in the elements of prosperity, the soil, climate, and people afford pledges of success, if roads, canals, railways, telegraphs, and the other agencies of progress be introduced; but above all, if that beneficent principle by which nations can only advance with enduring certainty be recognised in the administration of pure and untarnished justice; the future of our two hundred millions of fellow-subjects will be identified with their amplest productions and the largest commerce of the world; with civilisation untainted by the errors of superstition—a false philosophy, and our common Christianity will be received and embraced as the triumph of Britain's gracious rule. An enlightened and just policy applied to every British colony will yield the benefits of an extended commerce, blessing, like charity, those who give and those who receive, whether at home or in the foreign dependencies of Great Britain. Laws to be respected and obeyed must be just, and no system of polity can be permanent unless the material prosperity and welfare of the people under it be secured. For a moment contrast the course of industry in Lancashire, the great manufacturing and consuming district of this very cotton, with the East Indies, the country pre-eminently capable of supplying it in overwhelming quantities. In the one case from the battle of Plassy, 100 years ago, we have witnessed annexation upon annexation, oppression in taxes and rents, roadless and impassable territorial possessions, agriculture retarded, irrigation and public works discountenanced, justice frustrated, Juggernaut and the suttee long upheld to the perpetuation of superstition: and, finally, this ruling policy bore the fruit of which it had sown the seed—mutiny and its consequent horrors. In the other case, Lancashire during the same period has increased to an untold extent in the value of its landed and other property, in the numbers of its inhabitants, in its services to the State; and it has surmounted difficulties, natural, commercial, and governmental, thereby acquiring prosperity unprecedented. Of the moral and educational state of the workers in cotton manufactories it may be asserted that they are less the victims of vice and ignorance than are many of the labouring classes in some semi-domestic and other trades. No doubt the educational qualification which the law requires for children employed in factories is of great benefit to them; but this imperfect system of partial national education is invidious as applied only to children who labour in factories. Could, however, all the children in the United Kingdom derive the instruction afforded to those of them whose destiny places them in mills and manufactories, fewer would be the evils which are identified with ignorance. On this occasion time cannot be allowed to illustrate by other details the state and progress of the cotton trade; but the multitudinous advantages which have proceeded from this industry are in truth kindred representations of the benefits which have been derived from the great manufacturing and mercantile organisation of this country. In the manipulations of wool, flax, silk, and of all the metals are to be found proofs as important as those claimed for cotton that the modern manufacturing system by which the comforts of life are indefinitely increased, is, under a wise Providence, raising the moral, mental, and social condition of people everywhere, and is placing the necessities and elegancies of life within the grasp of countless classes, to whose predecessors such comforts were unknown. Evidence has now been adduced that the sustaining, clothing, and material comforts of life have been vastly increased, whilst literature, advancing with the age, has contributed to the mental elevation of the whole community. Under the old feudal system of the country the labouring classes had inflicted upon them privations and indignities which now they are no longer called upon to endure; they maintain their personal independence; and where, by mental attainments, industry, frugality, honesty, and perseverance, they strive for fortune and distinction, no hindrance to their

advancement exists. That the improved cultivation of the earth and mechanical applications to manufactures have added immeasurably to the ability of all to consume more largely, than at any former period of the surrounding plenty, created by intelligent industry, none will deny; but if a link in the chain of that plenty which now exists be required, look to the burthens of abundance freighted on the fleets of merchant ships, which traverse every sea, and which the wind and wave send as messengers of plenty and peace to the people of every land; see our shores fringed with the sails of every nation; see our old roads still loaded with the fruits of the earth and of toil; canals, their slow rivals, engaged in the performance of similar labours; then mark the progress of steam's rapid car, bearing on the railway those precious loads of human life, and that traffic which cannot wait for the locomotion of olden times; and, finally, see that despatch of weal or woe which heaven's lightning, made to drudge, sends from man to man, and bold will be the sceptic who disbelieves in the ameliorations of this age, prolific in practical benefits. Acknowledging, therefore, the existence of superabundance in everything which can promote the comfort and happiness of mankind, is its distribution directed to the reward of those who toil and spin? In every age of the world, rich and poor have existed, but the latter in modern times have diminished in proportion to the visible increase of the former; and when nature and art are in beneficial alliance, increasing the store of material comforts, these being produced beyond the possible consumption of the affluent, their surplus can only be absorbed by those whose reasonable wants need and deserve to be supplied; and, therefore, the rich who have always had the means of procuring enough, and requiring little of the increase, the masses of our fellow-creatures, who earn wages by their labour, are in reality the great buyers and consumers of the bounties which their labour provides. In days of yore, when manufacturers had no existence here, the rich procured their foreign luxuries by unholy traffic, and Britain's children were stolen and sold to bondage; yet then, as now, the wise and beautiful were amongst the daughters of our race, and from the expatriated of those their sprang a Queen who graced the throne of the great Constantine; but in these better days no tender ties are severed by us to procure wares which in our time honest labour buys. Later in the progress of early traffic our nobles obtained their Genoa velvets and their Damascus swords by the exchange of that corn which their estates grew, but which their hungry dependents could have devoured; though now neither feudal nor fiscal violence need disturb the self-adjusting commerce of nations, nor the laws of exchange interfere with the relative values of those commodities which men give and take from their fellow-men. With these facts illustrative of the power, utility, benefit, and enlightening influences of trade and commerce, may not the conclusion be sanctioned that industry and exchange are amongst the true auxiliaries of civilisation and comfort. When therefore we see our globe girt with the intelligence which intercourse diffuses; when the soils and climates of the earth are devoted to the production of materials which are indispensable to the industry and comfort of mankind; when genius and talent, guided by philosophy, prepare for the most effective application to useful purposes those materials; and when patient and enduring labour at home manipulates the gifts of nature grown in distant lands—can the good and practical result of man's exertions be otherwise than beneficial to his fellows of every country; but when the telegraph, steam, and other mechanical wonders are rendered subservient to the benefit of man, no other than grateful homage to the ever present though invisible Power which sustains the universe can animate those who would still advance and elevate the intellectual and physical condition of their species. On the recent visit of our gracious Queen to her loyal

town of Leeds, the progress of our town and the pecuniary and accumulative prospects of commerce were referred to, and in those visions of brighter days and developments which were then anticipated may the gladdening aspiration predominate that moral and mental attainments shall never be subordinate to mere material acquisitions. And may the British Association in its migrations scatter the seeds of progressive and practical philosophy, aiding by its wisdom, correcting by its knowledge, and encouraging improvements by its discerning approbation, till the light of truth banish the darkness of error and ignorance; and thus may an enduring alliance of the advantages of science be cemented with the practical benefits of trade and commerce.

TONNAGE REGISTRATION.

The Report of the Committee appointed by the British Association to inquire into this subject, was brought before Section G. at Leeds, when the following resolution was passed:—

“That the Report of the Shipping Committee be sent to the Council, accompanied by such a statement as the members of the Shipping Committee who declined to act on that Committee may think fit to prepare. Such report and statement to be dealt with as the Council may think fit.”

Under these circumstances it has been thought right not to publish the Report at present.

CONCERNING JAMES WATT.

The copy of an original letter from James Watt to a Mr. Geo. Mackay, on the subject of the steam-engine, mill, and machinery, subsequently erected for the Governor and Company of the British Cast Plate Glass Manufacturers, at the head of which was Sir Herbert Mackworth, the locale being Ravenhead, near Prescot, in the County of Lancaster, and the rough draught of agreement, dated Sept. 1, 1788, just seventy years ago, have been shown to the Secretary, who has received permission to publish the following particulars. The letter is given entire:—

Birm^m Oct^r 20th 1788.

Mr. Geo. Mackay.

Dear Sir,

We have made out plans for your Engine house & Mill House, which will be sent of by Tuesday or Wednesday. We have not been yet able to settle the Machinery, but have settled it so far as relates to the millhouse. The method proposed with the long rod moving the whole length of the house did not please, we have therefore provided for a long shaft as proposed first. I have also some reason to think the oval motion may not answer but have made the house that it will answer for either way. You will see that I have proposed the polishing shop to be next to the road wall and the grinding shop to be next to the Salt Houses, with the Engine house as near the edge of the bank as you shall judge convenient, and the angular piece left may serve for a coal yard. As for the method of Polishing it is far from being settled. I think you will do well to build the grinding shop and Engine house first and set that agoing before the other is begun, by which means we will be enabled to try experiments on the proper means of polishing, before we lay a brick of the polishing shop, you will please advise whether you begin building the season or delay till the spring. I am going from home for a week but shall write again when I return. I remain Dear Sir

Your Obed^t Hume^s Serv^t

JAMES WATT.

It appears by this letter that the whole arrangements of the Glass Works was left to Mr. Watt, for the agreement was entered into about a month before the date of this letter, when he had still to settle how glass might best be polished by a course of experiments, thus clearly proving the great trust that was placed in his skill, and his great caution, which warranted the trust in him. A subsequent note is as follows:—

"Messrs. Boulton and Watt present their compliments to Mr. Black, and have sent the deeds of agreement betwixt the Glass Company and them for the Company's seal, and have advised Sir Herbert Mackworth, Bart.

"Birmingham, 7th October, 1788."

By the rough draught of the agreement it appears that a licence was given to the Company to erect and use one of his engines capable of raising 47,000 pounds weight ten feet high in one minute, being estimated as equal to 14 horses power, for the remainder of the term of 25 years, granted by Act of Parliament in consideration of an annual payment of £70, and the said engine was not to be used at any other place than Ravenhead, or within ten miles distance therefrom.

There is an endorsement on the margin of the rough draught thus:—

"1788

Sept: 24

Approved H. M."

being the initials of Sir Herbert Mackworth.

There is also a curious annotation in it, a direction to the clerks,—

"The parchment to be turned up 2 inches."

Amongst the documents is another note, apparently for the purpose of formality in business, probably from the solicitor of Messrs. Boulton and Watt.

Birmingham, 7th October, 1788.

Sir,—By the coach this evening will be sent to Mr. Black the deeds of agreement betwixt the Governor and Glass Company and Messrs. Boulton and Watt, executed by the latter gentlemen. When the Company's seal is put to them, one is desired to be returned.

Sir, your most humble Servant,
JOHN SOUTHERN.

Sir Herbert Mackworth, Bart.

Accompanying the papers is a rude specification of the boiler, dated 17th October, 1788. "The man-hole is oval, 18 inches by 14, without a lid; the bottom is to be made of copper, 12 lbs. to ye square foot; the sides of copper, 9 lbs. to ye square foot; and ye top of copper, 6 lbs. to ye square foot." 6ft. 6in. in diameter, 7ft. 6in. in height, 6in. flat on edge, with the bottom to rest on the brickwork, and a hollow rim of 9in. along the bottom to catch the heat.

"Dimensions, both as to diameter and height, and also as to thickness of ye metal, to be strictly adhered to."

"N.B.—Ye top is half a globe."

Nothing is said about length. The thickness of metal is rather startling at the present day; the bottom about $\frac{1}{2}$ inch, the sides $\frac{1}{4}$ inch, and the top about $\frac{1}{4}$ inch. But working pressures then were only 7 lbs. per square inch; some difference from our modern locomotive pressures at 120 lbs. per inch. The wooden cask, with hoops, found in one of Mr. Watt's patents, for a locomotive boiler, with a fire in its belly, though a very original idea, would scarcely fulfil our modern conditions.

The first of Mr. Watt's engines to produce rotary motion was erected in 1787. The engine, the subject of the present article, appears to have been his second, and his profit for royalty was £5 per horse-power per annum for 25 years; thus, £1750 was the royalty on his second engine, distributed over a period of 25 years. It seems now a large payment for a 14-horse engine, but it is doubtful if our progress as a nation would have been hastened so rapidly had the legislature grudging the reward to our great inventor, as did his competitors after the fact was achieved.

It may be added that the above machinery for polishing glass has been in use continuously from 1788 to the present date, almost without alteration. New machinery is now being erected.

ELECTRIC TELEGRAPHS.

The Vienna correspondent of the *Times*, under date of the 27th instant, relates the following occurrence:—

"An accident which happened a few days ago at Zara (capital of Dalmatia, on the coast of the Adriatic sea) may, perhaps, serve as a warning to persons who are employed in repairing telegraphic wires. After a violent thunder-storm, accompanied by heavy rain, some workmen attempted to raise two or three posts which had been thrown down. Two of the men took hold of the wire, which was not broken, in order to assist their comrades, but hardly had they touched it when they uttered piercing screams. The one man staggered, and fell to rise no more, but the other remained on his legs. A third man, who was struck by his falling comrade on the shoulder, complained of violent pains in the head, singing in the ears, and indistinct vision. The hands of the two men who had taken hold of the metal were much burnt, and the one who escaped with his life stated, that as soon as he touched the wire he suffered 'indescribable' pains in the head and body."

SOUTH KENSINGTON MUSEUM.

During the week ending 26th Sept., 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 4,150; on Monday and Tuesday (free evenings), 5,532. On the three Students' days (admission to the public 6d.), 619; one Students' evening, Wednesday, 96. Total, 10,397. From the opening of the Museum, 612,548.

Proceedings of Institutions.

GLASGOW.—The thirty-fifth annual report of the Mechanics' Institution for the session 1857-58 speaks of its increasing usefulness and prosperity. Last year the Institution received a grant of £200 from the Ferguson bequest fund. Of this sum £150 was applied toward payment of the debt secured over the property, and the remainder was voted for the purchase of books for the Library. The number of students enrolled in the classes of the Institution was 887, being 140 above that of the previous session. In addition to the usual courses of instruction, morning and evening French classes were instituted and very successfully conducted. The abstract of the treasurer's accounts shows a balance of £70, remaining available for the objects of the Institution. The report then enumerates some presents which have been made to the Institution, and then proceeds to give an account of the various branches of instruction which are taught there. In chemistry, the teacher, Dr. Wallace, devoted the course to the consideration of the fundamental principles of this important branch of natural science, together with the study of the chemical history of the non-metallic elements and their most important compounds. Monthly examinations were held, for the purpose of ascertaining the progress made by the students and of awarding the Prizes. The Lecturer has expressed great satisfaction with the diligence and progress of the students. The course on natural philosophy, by Dr. Thos. Johnston, consisted of a series of lectures on the leading heads of mechanical philosophy, illustrated occasionally by experimental exercises. The capabilities of the students were tested, both by the writing of essays and verbal answers to questions proposed from time to time by the lecturer, on the subjects taught. In the class for music, the teacher, Mr. Barr, was occupied during the first half of the session principally in giving the students a thorough knowledge of the various characters used in music, and of singing at sight, in which very satisfactory progress was attained. The second half of the session was taken up in practising the singing of psalm tunes, glees, and popular songs. The lecturer was enabled to make advances with the theory of harmony to a greater extent than on former occasion in the Institution, owing to a r

of the students having attended during a previous session. The elocution class was conducted by Mr. G. M. Ferrier, L.R.C.S., and although this gentleman had the disadvantage of commencing late in the session, and of this being his first appearance in the Institution, he obtained a large class. The course consisted of twelve lectures. The principles of rhetorical reading were explained. Pronunciation and the different kinds of emphasis, as applied to expressive reading, were illustrated by vocal exercises. The French classes, conducted by Mons. C. A. Chardenal, B.A., were in three divisions,—two in the morning and one in the evening. The number of tickets sold was 128. The books used for beginners were "Hall's first and second courses of French Lessons," which were gone through by both classes of beginners. For the advanced class, which met at eight o'clock in the morning, the half of "Holt's Genius of the French Language" was gone over. The teacher recommends this work, for its excellence in French idioms and conversational exercises. He was well pleased with the attention and progress of all the pupils. The classes conducted by Mr. H. M. Ashcroft, for instruction in the higher branches of Arithmetic and in Mathematics, have increased considerably, 164 tickets having been sold. The students in this department were arranged into junior, middle, and senior classes. The junior class was occupied with the study of the first and third books of Euclid's elements; Algebra—as far as simple equations with one unknown quantity; Mensuration of superficies, and some of the rules of Arithmetic. The middle class studied the first and third books of Euclid minutely, the second algebraically, the fourth cursorily; Thompson's supplement to the fifth, some of the more important propositions of the sixth; plane Trigonometry; Mensuration of heights and distances, with the use of logarithms; Mensuration of surfaces and solids, and most of the rules of Arithmetic, from proportion onwards. The senior class studied: In Algebra,—all the subjects treated of in Montgomerie's Algebra: In Mensuration,—surfaces and solids, and some of the conic sections: In Euclid,—the six books, (Dr. Thomson's supplement to the fifth being used instead of the ordinary fifth book): In Trigonometry,—the analytical investigation of the formulæ for the different cases, and for the computation of tables of sines, tangents, secants, and others; and the application of these formulæ, simplified by logarithms, to the solution of various problems in navigation and mensuration of heights and distances: In the calculus,—the differentiation of Algebraic functions, maxima and minima, equations of straight and curve lines, and the elementary rules of the integral calculus. Upon all those subjects, numerous exercises were prescribed, and written solutions of them handed in weekly. With few exceptions, the attendance of the students upon the different classes was exceedingly regular, and the diligence and progress of all were highly satisfactory. The class for mechanical drawing, under Mr. Robert Harvey, has greatly increased. The pupils were chiefly engineers and tradesmen of mechanical professions. Mr. Harvey delivered his usual lectures on the more important details of the steam engine and applied mechanics, which were illustrated by a large collection of diagrams, and by models from the museum of the Institution. In the class for Drawing, Painting, and Perspective, conducted by Mr. A. D. Robertson, beginners were instructed in geometrical and elementary drawing of ornaments, flowers, figures, &c., having the general principles of perspective and the characteristic differences of Greek, Roman, and Gothic architecture and decorations explained to them. The students of the class for the study of trees and landscapes have made the most satisfactory progress, and those of the architectural advanced class have given the utmost satisfaction—the subjects of study being the classic, Doric, Ionic, and Corinthian orders. The students who studied perspective have shown an intimate and thorough know-

ledge of this most essential branch of art. The Botany class, under Mr. Roger Hennedy, consisted of 48 members. This interesting branch of natural science was highly appreciated by all the students. Excursions were made to various localities, thus giving the students opportunities of examining an extensive variety of plants and flowers with pleasure. The meetings of the Mutual Instruction Class have been held once a week. The debates and essays are, under certain rules, conducted by the students, without the interference of the Directors. The essays and subjects for debate amount to 34, and 22 students are engaged as principles. In the classes under the charge of Mr. Craig, the number of pupils and students has been from 1st May, 1857, to 14th April, 1858,—in the public day classes, 187; private day classes, 29; in the grammar and logic evening class, 176; in the arithmetic and book-keeping class, 204; and in the Phonography class, conducted by Mr. Stevenson, 58. The directors have lately purchased a considerable number of books, on science, art, and literature—these books have been placed in the library, along with those received from donors; the number of volumes amount to 6,300.

PORTSEA (WATT INSTITUTE).—On Thursday evening, the 23rd September, the members of the Portsea Watt Institute assembled in the Society's Hall to do honour to the two young men connected with that Institution who distinguished themselves in the late Society of Arts examinations, and who were then to receive the Certificates of Merit given to successful candidates by that Society. A tea was provided by the Committee of the Watt Institute, the more important business of the evening following.—W. HAMILTON, Esq., Paymaster of H.M.S. Excellent, President of the Philosophical Society, presided, and representatives of the three local institutions, in connection with the Society of Arts, were present. The CHAIRMAN said they were met for the very interesting purpose of congratulating on their success the two candidates from the Watt Institute who had received certificates from the Society of Arts, and whom he had great pleasure in introducing to their notice. The gentleman on his right (Mr. Wicker) succeeded in obtaining the first prize, and he (Mr. Hamilton) was happy to say that he had the good fortune to be in London, and to be present at the public dinner given to commemorate the meeting of the Society of Arts. The Earl of Carlisle was in the chair, and he felt exceedingly gratified at the manner in which that nobleman brought Mr. Wicker before the notice of that meeting. He was sure that Mr. Wicker would recall that circumstance of his life with the greatest pride and interest, as long as he lived. But if he felt gratified on that occasion when he was brought to the notice merely of an assemblage of gentlemen, he was sure that gratification would be doubled when he saw so many bright and pretty eyes expressing their approbation. He was sure he should only vex them if he detained them with any remarks on the advantages of education; he would, therefore, do no more than offer to the gentleman on his right the sincere and hearty congratulations of the company present, for the success which they had achieved in that high and honourable examination which they had been called upon to pass, and express their sincere and heartfelt wishes that the bright example they had furnished might inspire the minds of many of their fellow members to imitate their example.—The Rev. Professor MAIN, of H.M. dockyard, said, it had fallen to his lot, as Chairman of the Local Board of Examiners, to hand over to the successful candidates before them the certificates of merit so honourably acquired, and he did hope that their example would stimulate others who were coming on. They had furnished two candidates this year, both of whom were successful, and were a credit not only to the Watt Institute, but also to the town to which they belonged, and he hoped their example would be followed by many others not only of that Institution but also of other kindred Societies in the borough, and that

Portsmouth would still sustain the name which she enjoyed in common with other towns. The duty of examining gave them some little trouble, but he could assure the meeting they did it with pleasure, because they had a desire for the welfare of those around them, and if the numbers increased ten or twentyfold they would consider the labour required on their parts for the preliminary examinations well bestowed. He expressed the pleasure it afforded him to present the certificates which had been so honourably earned by Mr. Wicker. The first was the first of the three degrees of merit for arithmetic, algebra, and mensuration. In addition to this certificate, for his proficiency in arithmetic he received £5, for his proficiency in algebra, £5, for his proficiency in mensuration, £5. The second certificate was the second of the three degrees of merit in geometry, statics, dynamics, hydrostatics, and practical mechanics. The third certificate was the third of the three degrees of merit for trigonometry. To obtain these, Mr. Wicker must have devoted to his studies that time which others spent in what they considered to be a more agreeable manner, and he must have exercised considerable self-denial in that respect. He had great pleasure in offering him his congratulations. Addressing himself to Mr. Smith, Professor Main said he had also the pleasant task of handing him two certificates, the first being the second of the three degrees of merit in geometry and trigonometry, and the second, the third of the three degrees of merit in arithmetic, mensuration, statics, dynamics, and hydrostatics. He hoped this would stimulate him to further exertions, and he had much pleasure in offering to him also his congratulations.—Mr. WICKER on rising was received with much applause. He said that if he were to receive these certificates without any acknowledgment, they would think him unmanly and ungrateful, yet when he informed them that this was his first appearance in public, they must excuse the embarrassment he must necessarily feel. He had great pleasure in receiving the certificates at the hands of Mr. Main, and he hoped that he and Mr. Smith would not be the last to whom certificates would be awarded in this place, but that in each succeeding year more and more candidates would be successful in the Society of Arts Examinations. He felt himself unworthy of the honour they had done him that evening in giving him such a hearty welcome, and as he did not wish to forfeit their favour by a long speech, he would only express to them his sincere thanks for the same.—Mr. SMITH was also received with much applause. He said he tendered to them his grateful thanks for the encouragement that he and Mr. Wicker had received from them that evening, and to those of the same age as himself who had an inclination to present themselves at the examinations, he would say that he believed the name of the examination to be its most difficult part; if they would only apply themselves to study with earnestness and perseverance, and if they would give their time and trouble to prepare for these examinations there was no doubt they would find themselves in the position of Mr. Wicker, and obtain similar high certificates.—The Rev. H. HAWKES proposed a resolution to the effect that the meeting expressed its cordial good-will for the Society of Arts, and its approbation of the exertions it was making to promote the free diffusion of useful knowledge, in order to stimulate young men to self-education. He expressed his gratification at the successful results of the labours of the young men before the meeting and his cordial approval of the work undertaken by the Society of Arts. He more especially adverted to the fact that prizes had been gained by young women at the recent examinations, and dwelling upon the influence of women in their several relationships, in informing the character of men, showed how it was important that they, too, should be educated.—Mr. SPENCE, in seconding the proposition, entered into details with reference to the Watt Institute. After describing the cause which led to the establishment of that institution in 1848 by the factory

operatives, he described, from a prospectus which accidentally fell into his hand a few hours before the meeting, the state of the institution in 1849. Its classes at that time were very flourishing; the drawing class numbered 15 members; the reading class, 9; arithmetic, 20; writing, 24; natural philosophy, 18; algebra and geometry, 16; junior steam class, 20; senior ditto, 20, and singing class 26. Mr. Spence also briefly traced the work of that society since that year, and stated that it was still pursuing its labours in the same spirit. After stating that the financial condition of the Society was very encouraging, there being a balance in the hands of the treasurer, Mr. Spence entered into various details to show the importance and the fruits of unflagging industry in the work of self-improvement, and made other remarks to encourage those who were working like Mr. Wicker and Mr. Smith.—Mr. USBDELL spoke to the sentiment: "The Fine Arts, may they become universal." Mr. USBDELL briefly detailed the benefit arising from the cultivation of the Fine Arts, the recent rapid strides of our countrymen in this direction, and the opportunity afforded by the Athenæum classes conducted by Mr. Cunliffe, for students to obtain that instruction which was necessary to enable them to compete with credit at the Society's examinations. He expressed himself willing to give every assistance for the promotion of the object in view, and urged upon parents and guardians, and the youth of the borough, the importance of taking advantage of the facilities thus offered them for the acquirement of a knowledge of the Fine Arts.—W. RAWSON Esq., of H.M. dockyard, expressed the great pleasure he felt at being present on that occasion, one of the successful candidates having been for 8 or 9 years to a certain extent under his charge, and the other for a period of 5 or 6 years. He perfectly coincided with Professor Main not only in his congratulations to the young men before them and to the institution with which they were connected, but also in his congratulations to the town to which they belonged. But these were not the only prizes Portsmouth had carried off. There were in the town two men who had gained the highest mathematical honours in the Universities. One was Professor Main, and the other Mr. Besant, both of whom had reached the high and noble position of Senior Wrangler of Cambridge University. Others, too, who acknowledged Portsmouth as their birth-place, had obtained distinguished honours. It was therefore his fervent desire that the success which had attended the mental exertions put forth by the two young men before them, might influence them in all their after-life, and that it might induce others to follow in their footsteps. Mr. Rawson then said a few words on the sentiment, "The memory of James Watt," showing the nature of his great work, and the connection between him and other great men of our country, and concluded by pointing out the only way by which success could be ensured in the pursuit of knowledge.—The Rev. W. YOUNG spoke on the sentiment, "The education of the young, may it become universal, and based on broad and sound principles, common to all sects and parties."—Mr. CHARLES MAXWELL gave an interesting and humorous *résumé* of the life and writings of Thomas Hood, with quotations from the latter; and a vote of thanks having been given, which was duly acknowledged, the meeting separated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Sept. 17, 1858.]

Dated 7th September, 1858.

2025. G. Larmonnier and A. Bianche, Paris—Imp. in block-printing by hand on tissues, paper, or other suitable fabrics.

Dated 8th September, 1858.

2027. B. Hochlin, Gateshead Iron Works, Gateshead-upon-Tyne—Apparatus for repairing and fitting dock-gates and their machinery.

2020. J. O. Butler, Kirkstall Forge, near Leeds—Imp. in weighing cranes. (A com.)
2031. A. Lamb, Southampton, and J. White, Cowes—Imp. in life-boats.
2033. C. Bartholomew, Rotherham, and J. Bell, Swinton—Imp. in pistons and safety-valve levers of steam and other engines.
2035. J. U. Fassler-Petzi, Lyons, France—An improved process for the boiling off of tussah silks or wild silk.
2037. A. M. Peters, Edinburgh—Imp. in apparatus for regulating the flow or passage of fluids.

[From Gazette, Sept. 24, 1858.]

Dated 14th July, 1858.

1579. E. J. Maumont and L. B. Jaunay, Reims, France—An improved method of, and apparatus for, the production of sparkling wines.

Dated 24th July, 1858.

1673. H. Wikoff, Holly-lodge, Kensington Gore—An improved aperient medicine to be used in the shape of a biscuit, cake, or sweetmeat. (A com.)

Dated 28th July, 1858.

1712. A. Gallard, 58, Aldersgate-street—A new system of trusses. (A com.)

Dated 14th August, 1858.

1864. L. A. Ferot, 2, Rue Sainte Apolline, Paris—A new mode of ornamenting fabrics, and in the apparatus connected therewith.

Dated 21st August, 1858.

1903. M. Benson, Craven-street, Strand—Improved apparatus for generating steam. (A com.)

Dated 23rd August, 1858.

1912. C. Buono-Core, Naples—A liquid or composition which when applied to substances of any kind will render them fire-proof or unflammable.

Dated 28th August, 1858.

1934. J. Coates, Lower Shadwell—Imp. in apparatus or machinery for obtaining and applying motive power.

Dated 6th September, 1858.

2013. T. Warburton, Astley, near Manchester—Imp. in machinery for preparing cotton and other fibrous materials, and for doubling yarn.

2016. R. A. Brooman, 166, Fleet-street—Imp. in printing or marking words or figures on papers, parcels, books, pages, tickets, and other articles requiring to be marked, printed, stamped, or addressed. (A com.)

Dated 7th September, 1858.

2018. J. Shanks, St. Helens, Lancashire—Imp. in the manufacture of chlorine.

2020. J. Fyfe, Greenock—Imp. in stop cocks or valves.

2024. F. W. Brind, 14, Devonshire street, Bishopsgate—Imp. in sewing machines. (A com.)

2026. L. Pellissier and J. Puytorac, Bordeaux, France—Imp. in railway breaks.

Dated 8th September, 1858.

2028. J. R. Rostron, Edenfield, Lancashire—An improved press for packing or pressing wool and other materials.

2030. J. F. Dickson, 6, Russell-street, Litchurch, near Derby—Imp. in the construction of taps, cocks, valves, hydrants, and other apparatus for regulating the flow of water and other fluids.

2032. W. Parsons, Pratt-street, Lambeth—Imp. in apparatus to be applied to steam-boilers, in order to keep the surfaces of the tubular flues free from incrustations.

2034. W. Parsons, Pratt-street, Lambeth—Imp. in safety valves of steam boilers.

2036. R. A. Brooman, 166, Fleet-street—An imp. in the preparation of sulphate of quinine.

Dated 9th September, 1858.

2038. J. G. Newberry, Cardiff—An improved machine for tapping nuts, bolts, and screws, and other similar purposes.

2039. J. Luis, 1, Welbeck-street, Cavendish-square—An improved life-preserver raft of buoyant mattress. (A com.)

2041. J. Rowley, Grosvenor-terrace, Canterbury—New compound material applicable as a substitute for leather and leather cloth, in the manufacture of various useful and ornamental articles.

2043. C. N. Kottula, Liverpool—Imp. in the manufacture of grease for lubricating purposes.

2044. J. Tallow and H. Hodgkinson, Wirsborough, Derbyshire—Imp. in railway breaks.

2045. T. Timms, 1, Skelton-street, Greenwich—Imp. in bits.

2046. J. Wright, senr., and J. Wright, junr., Market-place-terrace, Caledonian-road, Islington—Imp. in machinery and apparatus used for preparing fabrics or materials to receive eyelet holes or fastenings, and fixing eyelet holes, and in fastenings for stays and other articles.

2047. W. Nimmo, Manchester—Imp. in weaving checks in power-looms.

2048. A. Baader, junr., Mittenwald, on the Isar, Bavaria—Imp. in the preparation of lubricating compounds.

2049. W. Clark, 53, Chancery-lane—Imp. in materials for dyeing and printing. (A com.)

Dated 10th September, 1858.

2051. J. Parker, Bradford—Imp. in steam boilers.

2053. J. P. Konig, Rue de Fleurus, Paris—Imp. in a surgical instrument called a pneumatic catheter.

2055. F. W. J. Johnson, London—Improved means of communicating between the passengers, guard, and engine-driver on railway trains.

2057. W. E. Newton, 64, Chancery-lane—An imp. in water wheels. (A com.)

2059. W. Towhach, Railway Works, Bristol-road, Gloucester—Imp. in pile-driving machines.

Dated 11th September, 1858.

2061. L. Hill, Port-Glasgow—Imp. in apparatus for lowering or paying out ships' chains and anchors.

2063. F. Glaeser, Great Central Gas Works, Bow-common—Imp. in the manufacture of coke.

2065. H. Page, Whitechapel—An improved crown or round glass, and apparatus for manufacturing the same.

2067. H. Wikoff, Holly-lodge, Kensington-gore—A new tonic medicine for the cure of coughs and diseases of the chest. (A com.)

2069. L. Kaberry, and T. Mitchell, Rochdale, Lancashire—Imp. in machinery or apparatus for preparing for spinning, and spinning cotton, wool, and other fibrous materials.

Dated 12th September, 1858.

2071. W. Thomson, Manchester—Imp. in bleaching yarn, wergs, or similar materials.

2073. J. B. A. Dugliéré, Paris—A new method of separating solids from liquids for disinfecting purposes.

2075. S. Hasbury, Birmingham Patent Iron and Brass Tube Company, Smethwick—An imp. in the manufacture of tubes of copper, brass, and other metals.

2077. J. Turner, Gresham-street—Imp. in the manufacture of hats.

Dated 14th September, 1858.

2079. C. J. Redpath, Limehouse—Imp. in ships' and other pumps.

2081. L. Vilde, Paris—Imp. in apparatus for measuring the pressure of fluids by the flexion of diaphragms.

2085. G. C. Grimes, Wandsworth—Imp. in fuses, and in the means of manufacturing fuses.

2087. A. H. J. Bastable, Belgrave Works, Ranelagh-road, Finsbury—Imp. in apparatus employed in the production of light. (A com.)

2089. Hon. W. E. Cochrane, Osborne-terrace, Regent's-park—An imp. in the fastening of railways.

Dated 16th September, 1858.

2091. E. Smyth, Brixton—Imp. in swimming belts and life-preservers.

2093. W. G. Taylor, Ashby de-la-Zouch, Leicestershire—Imp. in the manufacture of gloves.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2098. J. R. Seartiff, Wolverhampton—An improved burglar's detector.—17th September, 1858.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Sept. 24, 1858.]

September 22nd.

591. E. J. Manwaring.
590. H. L. Muller.
594. J. Rowbottom and T. Standeven.
610. C. F. Quinlin.
612. J. C. Wilson.
614. H. Gerner.
621. J. F. Brinjes, junr., and H. J. Collins.
622. W. and R. Wood.
623. J. V. Hieslakker.
624. A. L. Thirlion.
627. W. Crook.
648. H. Doulton.

653. J. Welch.
655. W. Davis and T. Harpes.
670. F. Robinson & E. Costain.
695. F. R. & J. A. F. Taverak.
715. B. Minton & R. H. Thomas.
792. H. Whittles, J. Schofield, E. Leach, and J. Lord.
885. M. Henry.
905. J. Maltre.
1005. J. Whitley.
1175. J. Lule.
1552. W. E. Newton.
1592. C. W. Williams.
1600. P. Fairbairn.

[From Gazette, Sept. 23, 1858.]

September 25th.

634. J. Young.
635. W. Robbina.
636. F. A. Chevallier.
637. R. A. Brooman.
638. W. Moxon, J. Clayton, and S. Fearnley.
642. R. M. Butt.
647. J. and J. F. Newman.
650. J. Bushell and T. Wright.
654. J. A. V. Burg.

656. F. Bousfield.
661. J. F. Spencer.
664. J. C. Durand.
666. I. and J. Brown.
669. W. Harding.
671. J. C. Durand.
672. W. Weallans.
694. F. J. E. Oosterlinck.
700. T. Boardman & J. Alcock.
714. E. Edwards.
1933. R. Brazier.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[From Gazette, Sept. 24, 1858.]

September 13th.

2125. W. Pollitt and J. Eastwood.

2191. J. R., R., and J. Musgrave.

[From Gazette, Sept. 23rd.

2146. J. Norbury.

- September 24th.

2129. J. Beattie.

September 21st.

2122. J. Dale.

- September 22nd.

2132. C. Manby and W. Piper.

[From Gazette, Sept. 23, 1858.]

2163. R. L. Johnson.
2175. J. Beattie.
2190. F. Gehstina.

ERRATUM.—The following patents, numbered respectively 1979, 1991, 1993, 1995, 1997, 1999, and 1991, were inserted in last week's Journal as taken from the Gazette of the 17th inst., instead of from that of the 10th inst.

Journal of the Society of Arts.

FRIDAY, OCTOBER 8, 1858.

ARSENIC IN PAPER HANGINGS.

The following extracts are taken by permission from the unpublished work "On Poisons," by Dr. ALFRED S. TAYLOR, F.R.S., accompanied by remarks by that gentleman:—

"There is one form of chronic poisoning by arsenic on which it will be proper to make a few remarks, as the real cause may remain wholly unsuspected. Arsenic is largely employed in this country, under the form of emerald green (aceto-arsenite of copper), and of orpiment in the manufacture of decorative papers with which the walls of sitting and bedrooms are covered. Some persons have suffered from symptoms of chronic poisoning by arsenic, in which no other cause was apparent than the continued respiration of the air of their rooms, charged probably at times with a fine arsenical dust. On examining the papers, they will be found in some instances loaded with arsenic, laid on in a rough and coarse manner, so as to be easily removable by friction. Arsenic is thus used in imparting a green tint to some of the most costly as well as the cheapest decorative papers. It is a practice fraught with danger in more respects than one, and under a proper system of medical police, it would not be permitted. In the kingdom of Prussia, the use of these papers is strictly prohibited. If there has not hitherto been much complaint on the subject, it may be attributed to the fact that the cause has not been suspected. Many obscure cases of illness, referred at the time to constitutional and other causes, may probably have been due to the effects of arsenical dust thus inhaled day and night by those who inhabited the rooms. Dr. Hinds, who suffered from the effects himself, has described two cases in which the prominent symptoms were prostration of strength, headache, thirst, loss of appetite—an inflammatory state of the conjunctivæ with heat and dryness of the fauces. (*Medical Times and Gazette*, May 23, 1857, p. 521.) A portion of the paper of the room in which these persons lived was sent to me, and on examination I found in the green pigment spread over it, a large quantity of arsenic. These facts should at least be borne in mind in cases in which it is suspected that poison is being secretly administered to another.

"Dr. Traill met with a case in which a child aged three years suffered severely from symptoms of arsenical poisoning, owing to its having sucked some slips of paper coloured with this green pigment; some of the paper, still retaining a green colour, was passed in the motions. The child recovered (*Edinburgh Monthly Journal*, July, 1861, page 1.)

"Among other uses of this noxious compound, we find it employed for imparting a bright green colour to the shelves of bakers' and green-grocers' shops. An incident which occurred to myself will show that food may thus acquire an arsenical impregnation. Several loaves of bread were supplied to me, having upon the undercrust a quantity of green-coloured pigment, which on analysis turned out to be arsenite of copper, containing about fifty per cent. of arsenic! On inquiry, I found that the baker had recently painted the shelves of his shop with this pigment, and the hot loaves placed upon them had taken off a portion of the arsenical paint. It is easy to conceive that an accident of this kind, if undetected, might lead to serious results, and perhaps to very erroneous suspicions. (*Medical Times and Gazette*, April, 1864, p. 326.)

"Another alleged form of poisoning by this substance which has attracted some attention, is in the state of vapour or fine dust applied to the membrane of the lungs,

or in the state of powder as applied to the skin. In the former edition of this work the following case was related. A young man, after having been engaged for nine days in printing with an arsenical green pigment, was seized with irritation and watery discharge from the nose, swelling of the lips and nostrils, and headache. The next day he experienced severe colic, and great muscular weakness; but these symptoms disappeared in about eight days. It is probable that, in this case, the arsenite of copper had been taken into the body in the state of fine powder. (See Arsenical vapours, ante, p. 426.) I have since been informed, that the persons who manufacture and hang the coloured paper on walls, suffer from boils, inflammation of the eyes, and other symptoms of irritation. In one case now under treatment, pustular tumours have shown themselves on the wrists and ankles, and there is excessive sensitiveness and irritability of the skin. If removed the patients soon recover. In a former page I have alluded to the mysterious deaths of a whole family (see cases of the Arzone family, ante, p. 120). The father was a pigment-manufacturer, and there is great reason to believe that he and his family fell victims to the respiration of arsenical dust or vapours. According to M. Bouchardat (*Annuaire de Thérapeutique*, 1846, p. 209), the workmen who handle the emerald green in making the papers, are subject to serious disorders of health. They sometimes suffer from eruptions of the skin—one of the local effects of poisoning by arsenic (see *Assoc. Med. Journal*, 1856, Sept. 6, p. 371, 757; Sept. 20, p. 810, and ante, p. 371), with œdema (watery swelling) of the face, and boils frequently forming in the scrotum. There is irritation with discharge of fluid from the mucous membrane of the nose, and abundant salivation. In the more advanced stage, there are colicky pains, headache, and prostration of strength. (See *Ann. d'Hyg.* 1847, ii. p. 56; and *Journal de Chimie*, Juillet, 1858, pp. 394, 397.)

"More than ten years since, Dr. Martin announced that the use of this arsenical green in oil-paint had an injurious effect upon those who inhabited apartments recently painted with this substance. Four pounds of Scheele's green had been used in painting the walls of a low damp room. In a few days a putrescent and highly disagreeable odour was perceptible. When the windows were closed, those who remained in the room experienced headache, pain in the chest, and other disagreeable symptoms. The colour was scraped from the walls, and the room was then inhabited without any of these unpleasant symptoms being observed. Dr. Martin attributed the effects to the production of arsenuretted hydrogen. The poisonous salt may, however, have been itself carried off in vapour, like white lead, under similar circumstances, by the oil of turpentine. In a note attached to this case, it is stated that since the mixed acetate and arsenite have been substituted for carbonate of copper in painting the walls of rooms, many persons who have slept in rooms painted green, have complained in the morning of headache, nausea, dryness of the mouth and throat, and cough. The symptoms went off during the day. In one instance the foul odour was referred to mice, and the wainscot was about to be removed, when a suspicion arising that it was owing to the green colour used as a pigment, this was removed, and the smell disappeared. (*Gas. Méd.* 13 Fev., 1847, 180.)

"I have elsewhere referred to the probable effects of wall-papers loosely covered with the aceto-arsenite of copper (ante p. 364). This pigment contains fifty-nine per cent. of arsenic, and from some of these papers the noxious material may easily be scraped or removed by friction. A square foot of the paper may yield from twenty-eight to seventy grains of the arsenical pigment, and in rooms exposing five or six-hundred square feet, a large quantity of arsenic is thus distributed over an extensive surface. Dr. Hinds, of Birmingham, noticed, that in occupying a room which was covered with a wall-paper of this kind, he suffered from severe depression,

nausea, pain in the abdomen, and great prostration of strength. These symptoms appeared every evening that he sat in this room: this led him to suspect that they were connected with this room, and on examining the paper he found in it a quantity of arsenic. (*Lancet*, 1857, vol. i., p. 193). Two other cases occurred in his practice, where similar symptoms were produced in a man and his wife, under similar circumstances. To these I have elsewhere referred (ante, p. 365). Dr. Halley, of Harley-street, suffered from constant headache, dryness of the throat and tongue, with internal irritation. In about three weeks, he became completely prostrated, and was threatened with paralysis of his left side. He called on me and described his symptoms, bringing, at the same time, a portion of the wall-paper of the room in which he was in the habit of sitting; and this I found to be loaded with arsenic. He removed the paper, and since then has recovered his health. Several cases have since come before me, in which, whether real or imaginary, symptoms of a similar kind have been referred by persons to the habitation of rooms papered with the arsenical green. At the same time, there have been many cases in which the occupation of rooms thus papered has been attended with no injurious effects. This fact, as well as a few imperfect experiments, have led some persons to affirm that the arsenical papers have not produced the effects ascribed to them. (See *Pharmaceutical Journal*, April, 1858, p. 520, and May, 1858, p. 554). The connexion of cause and effect, however, appears to me to be too plainly made out in the cases of Dr. Hinds and Dr. Halley, to be set aside as a mere coincidence. The symptoms in both cases were similar, and such as arsenic is well known to produce; there was no other source of arsenic, and no other cause to explain them; and they entirely ceased on the removal of the arsenical paper. It may not be easy to detect arsenic in the air of a room thus papered, but then it is equally difficult to detect lead in the air of freshly painted rooms, in which persons have been paralysed by passing a night. In the year 1837, and subsequently, arsenic was largely used in the manufacture of a spurious kind of wax-candle. The workmen suffered from boils and other disorders, and some who occupied rooms in which such candles were burnt, complained of symptoms like those of arsenical poisoning. As in reference to the arsenical papers, it was alleged,—because arsenic could not be detected in the air of a room, and all persons did not suffer from the use of the candles, that the illness was owing to some other cause. Although there are difficulties in explaining how it happens that more accidents do not occur, it appears to me there is already sufficient evidence to justify an enforcement of the Prussian regulation prohibiting the use of arsenic for such a manufacture, or in allowing the paper to be sold only on the condition that the words “arsenic, poison,” are stamped upon it. (See *Pharm. Journal*, May, 1858, p. 553.)

“Dr. Böcker of Bonn, one of the most recent writers on Toxicology, refers to the effects of chronic poisoning produced on persons inhabiting rooms of which the walls are covered with arsenical paper hangings, and states, that on several occasions he has been called upon to treat such cases. A removal of the cause has generally proved sufficient. Dr. Böcker considers that a damp state of the wall renders them injurious. (*Die Vergiftungen*, 1857, p. 132.)”

Note.—I append an abstract of a notice issued by the Prussian government in reference to arsenical paper-hangings on the 3rd September, 1857. (*Caspers Vierteljahrsschrift für Gerichtlich Medicin*, Januar 1858, p. 184, Art. xxiii.)

“The Board of Police cannot too strongly impress on the public, the danger to health arising from the use of arsenical colours, especially in the habitation of rooms the walls of which are painted with such colours, or are covered with arsenical paper-hangings. The breathing of the vapours (air) in such rooms, has produced all the effects of slow poisoning by arsenic, namely, disordered

digestion, difficulty of breathing, cough, colicky pains, weakness of the muscles, trembling and loss of power in the limbs, falling off of the hair, abscesses in the skin, emaciation, a wasting fever, and death. In removing arsenical papers from walls, they should be first well washed with salt-water, as the respiration of the arsenical dust may cause serious symptoms or death. The Board of Police earnestly entreat all medical men in their respective districts to advise the removal of arsenical colours from the dwellings in which they may be used.

“KONIGL. POLIZEI, Präsidium.

“FREIHERR V. ZEDLITZ, Neukirch.

“Berlin, 3rd Sept. 1857.”

REMARKS.—It is not my intention to take part in the controversy which has arisen on this subject. It appears to me that it is leading the minds of the public from the true subject at issue. Mr. Phillips may be right in his conclusion that he could detect no arsenious acid in the air of a room covered with these poisonous paper-hangings; and “Crystallographer” may be right in assuming that the octahedral crystals seen by Dr. Halley may not have been arsenic but “microscopic diamonds” derived by some mysterious process from the carbon of the paper, or of the atmosphere. The question is not one of chemistry or crystallography, but really one of pathology. Certain symptoms, unquestionably those of arsenical poisoning, have arisen in certain persons who inhabited rooms of which the walls were covered with these papers. They have existed with the papers; they have disappeared on their removal. These facts are perfectly in accordance with those collected by the Prussian Government, and which have induced that Government authoritatively to prohibit the use of these paper-hangings.

Mr. Phillips brings forward his own case and that of his family, as a proof that the use of such papers is not noxious or injurious to the health. It would be easy to produce cases from the arsenic works of Cornwall, to show, by the exemption of some workmen, that the vapours of arsenic were not poisonous; and, from white-lead works, cases which show that many workmen do not suffer from lead poisoning; but it is well known that we are not all constructed alike in reference to the effects of poisons, and it is just possible that there may be a susceptibility to the action of arsenic in a few, while the majority may escape.

I must, however, express my surprise at Mr. Phillips's conclusion, which appears to me substantially to admit the great danger to which the use of these papers in our dwellings must expose us; whilst at the same time, his paper is leading the public to believe, because he found no “octahedral crystals,” that there is no danger at all.* He says:—

“In conclusion, I beg to express my opinion that no danger need be apprehended from a paper such as the one annexed, in which but a small proportion of the surface is unglazed, provided ordinary care be used when removing the dust from the walls, but that even if such care were not exercised, it is doubtful (!) whether any pernicious effects would be felt by those inhabiting the room.”†

The question immediately suggests itself—What will happen in the dwellings of those who cover their walls with cheap arsenic papers entirely unglazed? One of these I have now before me, and the arsenical pigment is rubbed off the surface with the slightest friction. Again, it would appear from his statement that even the glazed arsenical papers must be dusted with care. The breathing of the green dust of arsenite of copper may be just as fatal to life as the breathing of microscopic crystals of white arsenic; and, supposing that by careless dusting, &c., the poisonous material is diffused in a room, and breathed by persons inhabiting it, it is by no means doubtful but certain what the effects would be.

* Leading article in *Daily News*, Sept. 1st, 1858.

† *Journal of Society of Arts*, August 27th, 1858, p. 697.

I am one of those who think that the fine and impalpable dust which is diffused through a room by currents of air, mechanical agitation, &c., is derived from the material on the walls as well as from the floor and ceiling. The walls generally present twice the extent of surface. If the powder on the walls is of an arsenical nature, it is not easy to perceive how, apart from the mechanical dusting of domestics (indispensable in most houses), we can prevent the occasional diffusion of a poisonous dust in an impalpable state. We are only made conscious of the existence of this diffused dust by the striking of a sunbeam across an inhabited room. They who prefer the "cheerful" green of an unglazed arsenical paper must, therefore, according to Mr. Phillips, be prepared to incur some risk—care must be taken that the walls are not too frequently or roughly dusted!

I have found, with respect to some of these papers, that they contain arsenic in a form soluble in water, and that in mixed patterns, parts of the papers surrounding the arsenical green colour are impregnated with arsenic. By scraping the arsenical pigment from the surface, or by soaking slips of the paper in water, the means of poisoning are always at hand. During the last summer I caused some of the arsenical paper to be moistened with water containing a small quantity of sugar. Flies which settled upon it were rapidly killed. As an objection to legislation for restricting the sale of arsenic, it was stated by a well-known pharmacist that arsenic might be easily procured for criminal purposes by scraping the walls of almost every dwelling house! This is an additional point for consideration in reference to the domestic use of this dangerous pigment. We require strong restrictions on the procuring of arsenic from a druggist's shop, and at the same time place the poison within reach of any evil-disposed person under such circumstances as to ensure secrecy of possession and use. A square foot of this paper contains enough arsenic to poison five or six persons.

In your *Journal*, Vol. v., p. 652, and Vol. vi., p. 606, you have made a reference to my evidence on this subject before a Committee of the House of Lords. I may mention to you that the inquiry arose under these circumstances. Their Lordships desired to know what became of the large quantity of arsenic manufactured in and imported into this country. I informed them that a very large proportion was spread in the form of pigments over the walls of our dwelling houses. I have since learnt that one London manufacturer alone was in the habit of using about *two tons of arsenic per week* in the production of this green pigment for paper-hangings! Its cheapness and durability as a colour recommend it strongly to public notice. Since the evidence which I gave before the Committee of the House of Lords, fifteen months ago, I have had still stronger reasons for holding the opinion then given respecting the danger attending the use of these papers. Mr. Phillips suggests glazing and o dusting. I would suggest that some other green colour should be selected, even at a little more cost. If the manufacture of arsenical papers is to be continued, the Prussian poison-symbol of a skull and cross-bones, with the motto *emendo mori*, should be printed as a pattern upon it; at least, it should be intimated to all who purchase paper-hangings that they contain arsenic.

ALFRED S. TAYLOR, M.D., F.R.S.

15, St. James's-terrace, Regent's-park,
September 27, 1858.

The following paper, by Dr. William Hinds, bearing immediately upon the same subject, is extracted from the *Pharmaceutical Journal* for the 1st inst. :—

Certain carefully-prepared papers, which recently appeared on the above subject in the pages of the *Pharmaceutical Journal*, not having been, as far as I am aware, fully replied to, I beg to offer to the readers of the above interesting journal a few observations on this subject. Great confusion of ideas seems to prevail extensively as

to the facts brought before the public, while even the deleterious influence is itself denied in some quarters. It is by no means uncommon to see theoretical denials and disputes by some persons, in reference to facts and truths, which are nevertheless characterised by such stern features as to be realised as facts and truths by others. The views advanced by myself and others as to the injurious effects of arsenical papers in rooms, I believe to be unquestionable. Arsenite of copper, as a poisonous pigment, I find frequently recognised by writers on medical jurisprudence; but so far as I have been able to learn, to Dr. Alfred Taylor belongs the merit of more especially commenting upon the dangers to be apprehended from its employment. In his invaluable work, Dr. Taylor gives a case, in which "a young man, after having been engaged for nine days in printing with this arsenical green, was seized with coryza, swelling of the lips and nostrils, and headache. The next day he experienced severe colic and great muscular weakness." Dr. Taylor adds the valuable remark, that "in this case the arsenite of copper had been taken into the body in the state of fine powder."

This shows that Dr. Taylor's attention had been specially drawn to the subject. At the same time I may remark, that to the best of my knowledge, no case of actual poisoning had ever been made public, as having occurred from simply inhabiting a room hung with the arsenical paper, until my own case was published in the *Medical Times and Gazette* in February, 1857. The accident occurred to me as far back as 1849; but the case being, as I then thought, so unique and unparalleled, I hesitated to publish it until I had had means of collecting other cases, or until a favourable opportunity.

The way in which I was led, step by step, to certain conclusions as to the injurious effects, and also a description of these effects, are given exactly as they occurred in the paper mentioned, and to which I beg to refer those who may feel an interest in this subject.

In the next cases which came under my notice, the moral force of the evidence was so strong, as to satisfy the most sceptical. The injury occurred to a Mr. Simpson, of this city, and to his wife. Mr. S. had enjoyed the best health until he had a green flock paper put on the walls of two sitting-rooms. In a very few days he experienced all the symptoms of slow arsenical poisoning, but without either believing in, or even suspecting the cause. He became seriously ill, as also did his wife; and a fine parrot, which was hung in one of the rooms, all at once drooped and refused food. At this stage a gentleman, who had known of my own case, suggested a solution of the mystery as to the cause of the illness, but Mr. S. repudiated the supposition. He then left town for his health, returning in a fortnight quite strong and vigorous, and confident he should continue so. In several days he became again seriously ill, and after long residence, he became deeply convinced, by the very force of circumstances and suffering, that the cause lay in the wall paper. He underwent the expense of an entire removal of the paper, and soon after all were well. The gentleman here mentioned, would, I am sure, be glad to give his experience to any person who might be sceptical as to the facts.

Mr. S.'s case is fully detailed, without names, in the scientific journal before mentioned, for May, 1857.

In the case published by Dr. Halley in the *Times* newspaper, the facts and results are as striking and forcible as in the other published cases.

I have to say one word as to the mode of escape from these arsenical papers of the poisonous colouring matter, and I must observe that a vast deal of entirely irrelevant speculation and equally futile experiments have been expended, with a view to disprove facts, about which it is astonishing that any reasoning person can have a just doubt. A sample of this irrelevancy I will presently mention.

I find papers in this journal for May and June, evi-

dently from able contributors, denying our conclusions, which the space I could request would not enable me extensively to notice. For this, however, there is the less necessity, inasmuch as these writers give but negative results for the most part. I believe I am justified in saying that our positive facts and forcible moral evidence are not shaken by mere negative results, and miniature and usually irrelevant experiments. Neither is the question a mere chemical one, to be easily decided in miniature. The existence of the poisonous ingredient upon the paper is admitted, though one gentleman seeks to spoil this admission, by asserting (truly enough) that the flock portion is a mere dyed stuff, and contains nothing injurious. The injurious effects, moreover, of arsenite of copper, when inhaled, are equally admitted. Now, that mere water-colour pigment, without an overcoat of varnish, will give off, under certain hygrometric conditions, particles of its dust to the atmosphere, is perhaps so self-evident as not to require any laboured proof. The fact is indeed unquestionable. Take a feather or a soft white napkin, and run either never so lightly over a green paper of the ordinary kind, after it shall have been placed upon a wall by means of paste, and myriads of particles of the colour from the surface will adhere. Much, of course, is sent floating in the atmosphere of any room by the least possible disturbance of its contained air, as by draughts or the opening of doors. These particles will be then breathed into the lungs, and produce all the symptoms which have been described. A great deal has been said about volatilisation of arsenic and arsenical vapour, but it is not all to the purpose. Dr. Taylor's idea, as given in this journal for May last, and the same as it presented itself to me in the first case published, is, I believe, the only rational one—namely, that the finer and lighter particles of the colour escape as such. Now, what is the dose of this fine powder of Scheele's green necessary to produce bad symptoms? That is a question to which I cannot give an answer. Probably it is extremely small in quantity. Dr. Taylor, whose labours place him at the head of his department, in this country at least, has not attempted, so far as I know, to give a reply to this question; and the means by which the deleterious particles become active in the system, present several difficulties not easily to be solved.

There is one experiment I would beg to urge strongly upon the gentlemen who are sceptical as to our facts. It is that they should place themselves in the same conditions as those under which our facts were gathered. I shall be happy to furnish any gentleman who may wish to make the experiment, with samples of arsenical paper from which to select. Let a room be papered with one of these, and let the experimenter undergo the same experience as we who have suffered, and I shall have little doubt that he will come out of the trial fully convinced. I would be still better to make a series of trials, in order to avoid any incidental negation.

I may here mention the fact of the universal testimony of workmen who have been in the habit of hanging green paper, to the often severe symptoms which they experience while at work. One most powerful man, a paper-hanger, told me he has repeatedly got so ill with coryza, chest complaint, and prostration, while hanging green paper, that he has been compelled to leave the room, and has been unable to finish his work. This man could tell me that green paper was very injurious, though I am not present to be told that the colour was arsenical. I am sure it will be borne in mind, that in all these cases the symptoms were of the kind indicative of slow poisoning, such as catarrhitis, prostration, loss of muscular energy, and dryness of throat; and, in every case, the cause was at first entirely overlooked. In my own case I did not take the least notice to the colour of the paper until I had suffered myself with any examination of the paper, and then I found that the

attention was gradually attracted to every altered condition of the room in which I sat to read. I had previously used the room for years with no inconvenience. The symptoms came on in three or four days after the papering. They ceased on my ceasing to occupy the room. They recurred every time I had for some hours again used it, and they never after appeared after the room was stripped of the injurious paper. The very same conditions, or very similar, were experienced by Dr. Halley, whose communication on the subject appeared in the *Times* of the 11th of January of the present year; and the same also in Mr. Simpson's case, to which I have before alluded.

I will now give a specimen of the "experiments" by which the facts we bring forward have been met. Several experiments have been detailed in this journal by Mr. F. A. Abel. I desire to be entirely just to Mr. Abel's efforts, but I cannot think his scientific knowledge was present to him at the time of those experiments. I will explain my meaning. On coming to the seventh experiment, Mr. A. makes the following most remarkable statement. He says: "It should be mentioned that in all these experiments, the tube was plugged with cotton wool." Now we refer to the other conditions of these experiments, and we find that the temperature is raised to only 90° on the one hand, and on the other, the tube was plugged with cotton wool, to allow no particles to escape mechanically! Mr. Abel will forgive me for reminding him of a fact he already knows—namely, that arsenic can only be volatilised by heat at a temperature of 380°; and yet he sticks to 90°, and plugs the escape-tube with cotton-wool, to prevent the mere mechanical passing of arsenic. I am sure Mr. A. will see the entire inconsistency and inapplicability of his whole experiments, on a reconsideration of the subject.

In Mr. Dugald Campbell's experiments, given with candour and clearness, the conditions were essentially different from those in which arsenic is given off in a room; for while the 140°, the highest point to which Mr. C. raised the temperature, were less by no smaller a quantity than 240° than the temperature required for the volatilisation of arsenic; a square foot only of paper, and confined in a bottle, is a very different thing from a square foot, indeed I might add 500 square feet, or 1000, pasted upon a wall, and subject to certain important hygrometric transitions, which favour the loosing of the colour, and its escape into the atmosphere of the room.

Some observations have also been made in the journal by Mr. B. H. Paul, and are given with great candour. Those remarks contain no experiments on the subject in question, and, as they are directed more especially against the gratuitously-conceived theory of vaporisation of pure arsenic by heat, inapplicable in the present case, require little remark. In conclusion, I may express my regret to perceive how completely an ascertained fact, as communicated by Dr. Taylor, in reference to the actual observance of particles of Scheele's green upon a slip of glass, can be ignored by a mere surmise.

BRITISH ASSOCIATION, LEEDS, 1858.

ON THE PROGRESS OF MECHANICAL SCIENCE.

The following is the Inaugural Address "On the Progress of Mechanical Science," delivered before the Mechanical Section of the British Association, by WILLIAM FAIRBAIRN, F.R.S., President of the Section:—

In opening the business of this section of the British Association, I have to congratulate you upon the encouraging prospects which our meeting in this great mart of industry is calculated to afford. This large and important district is only just recovering from a state of intense excitement and a burst of loyalty that have reverberated from one extremity of the Kingdom to the other. In these rejoicings I have naturally taken a deep

interest, and now that the royal visit is over, a meeting for the extension of science and useful art is probably the most appropriate conclusion of the festivities which have occupied the attention of this town for the last two weeks.

On a former occasion, when I had the honour of occupying the chair of this section, I endeavoured to combine in a condensed form such improvements in mechanical science as had been effected during the successive intervals between the annual meetings of this Association, and conceiving that a short account of what has taken place during the last few years may not be unacceptable, I have on this, as on previous occasions, ventured to direct your attention to a succinct retrospect of what I consider new and valuable in mechanical art.

In mechanical science and general engineering this country continues to maintain its high position in new developments and continued progress; and the almost innumerable patents weekly taken out under the new law, are remarkable indications of the activity and inventive power of the country. It is not yet thirty years since the introduction of malleable iron as a material for shipbuilding, and a much shorter time has elapsed since it was first applied to the construction of bridges. We have all of us heard of the tubular system so successfully applied to the bridges across the Conway and Menai Straits, and now it is extensively employed in every quarter of the globe. There is no span within the limit of one thousand feet, but which might be compassed by the hollow-girder bridge with security and effect. These discoveries are of immense importance to mankind, and where they are carried out with skill and a strict adherence to sound principles of economy and science, they give to the engineer of the present day a power which in former times it was impossible to realise.

STEAM NAVIGATION.—In this department of practical science, although much has been done, yet much remains to be accomplished in giving to the iron ship uniformity of strength and security of construction. In vessels of such complex form, bounded by such a variety of curved surfaces, we are yet much at sea as to the precise points of application of the material, in order to attain the maximum of strength combined with lightness and economy. These are data yet to be ascertained, and it will require long and laborious experimental research before the facts are clearly known and established. Much has, however, been accomplished in the absence of these data, and I may safely refer to that noble structure, the *Leviathan*, which, with all her misfortunes, is, nevertheless, a most magnificent specimen of naval architecture. The cellular system, so judiciously introduced by Mr. Brunel, is her great source of strength; and I am persuaded that she will stand the test (which I have recommended in other cases) of being suspended upon the two extreme points of stem and stern, with all her machinery on board. Or, these conditions being reversed, I believe she may be poised upon a point at her middle, like a scale-beam, without fracture or injury to the material of which she is composed. Her cellular construction and double sheathing round the hull, and the same formation on the upper deck, give to the vessel enormous powers of resistance, and her division and subdivision by bulkheads ensure a large margin of security, in whatever circumstances she may be placed. In fact, she may be considered as a large hollow girder, requiring a load of nearly 10,000 tons suspended from the centre to break her. I mention this to show that her want of success is not due to any want of success in the ship herself, but to the magnitude of the speculation as a commercial transaction, and her unmanageable character in regard to the shipment of cargo, and similar difficulties which she may be called upon to encounter. I hope, however, that the necessary funds will be forthcoming, and that we shall yet see her dashing aside the surge of the Atlantic at a speed of eighteen or twenty knots an hour.

RAILWAYS.—The magnitude of this great republic

(as it is called) of speculation and industry is scarcely, if ever, appreciated by the public. We look at the locomotive of the present day, or glide by its means over the surface of the earth, without once thinking of the amount of skill and of capital expended in the production of such vast and important results. At the present moment we learn from returns recently published, that we have in this country alone 9,500 miles of railway executed and in actual operation. And, taking at a rough calculation one locomotive engine of 200 horses power to every three miles of railway, and assuming each to run 120 miles a day, we thence calculate the distance travelled over by railway trains to be equal to 380,000 miles per day, or the enormous distance of 138,000,000 of miles per annum, a space measuring the distance of the planets, and beyond the conception of those not conversant with figures. To transport engines and trams this distance, requires a force equivalent to that of upwards of two hundred thousand horses in constant operation throughout the year.

—As regards the commercial value of railways, it will not be necessary to enlarge upon it in this place. Suffice it to observe that a clear revenue of £12,000,000 is left, after all expenses are paid, for distribution amongst shareholders and creditors. This amounts to 3½ per cent. per annum, a small return upon £320,000,000, the original cost of 9,500 miles of railway, an average of £34,000 per mile.

In the locomotive engine there has been no improvement of importance during the last two years, excepting only its adaptation to burning coal instead of coke, without the production of smoke. To a certain extent this has been successfully accomplished, but the process is still far from perfect. Superior training is wanting for engineers and stokers before we can look forward with certainty to the time when the use of coal will become general, with increased economy and with the suppression of the nuisance of smoke.

In the formation of the permanent way considerable improvements have been effected, especially in the jointing of the rails by what is termed the fish-joint, which secures a more perfect union of the rails, produces a smoother surface, and diminishes the wear and tear of the rolling stock, when compared with the old system of jointing, so sensibly felt in carriages running over the line at great velocities.

MANUFACTURES.—For the last twelve months, great depression has existed in this department of the national industry, and notwithstanding the attempts to cheapen the production of the staple articles of manufacture, by the introduction of improved machinery, there still exists a considerable depression in many of the great marts of industry. This is probably to be attributed to the disturbed state of India and China, but looking at the native activity of the manufacturing population, and the amount of capital employed, there has been no serious diminution in the production of manufactured articles, nor any stagnation in the demand for labour. On the contrary, I believe, with the exception of the causes just alluded to, that the manufactures of this country were never in a more flourishing condition.

In the iron trade, with which this section is more immediately connected, there has been a similar but slight depression, the manufacture of pigs, plates, and bars being as great as in any former year; and taking into account the improved process by which malleable iron and steel is now produced, there is reason to hope for a greatly increased demand and an enlarged production. In fact, such have been the improvements since Mr. Bessemer first announced his new process of boiling the crude iron direct from the smelting furnace, and dispensing with the puddling process, that we appear to be now in a state of transition from the old system of smelting, refining and puddling, to a more direct, continuous, and improved process of manufacture.

Steel bars and plates are now made without the intervention of an intermediate and tedious process, and we

may reasonably look forward to the introduction of an entirely new article of manufacture of greatly increased powers of resistance to strain. Although, hitherto, Mr. Bessemer has not succeeded in producing malleable iron by his new process, he has made beautiful refined iron, and has stimulated others to attempts at improvement in the same direction. His discoveries, first given to the world through this section of the British Association, have already proved of great value to the community, and we look forward with confidence to the introduction of still greater improvements—improvements by which steel plates and bars will be produced at almost the same price as we can now obtain the best manufactured iron.

THE MACHINERY OF AGRICULTURE.—This is a branch of mechanical art which requires the careful consideration of the mechanic and the engineer. The time appears to have arrived when the introduction of machinery, combined with the wide diffusion of education amongst our agricultural population is absolutely necessary, and in my opinion, increased intelligence, together with new machinery, will double the production of the soil and improve the climate in which we live. Much as has already been done, very much has yet to be accomplished; we must persevere in the new processes of deep draining and subsoil ploughing, and in the substitution of steam power in place of horse and manual labour, before we can realise such large and important advantages as are now before us. Great changes and improvements have been effected in my own time, by the introduction of new implements to relieve the labours of the farm. Everything cannot, however, be done by the mechanic and engineer; much has to be done by the farmer in the preparation of the land to render it suitable for machine culture; and a willing heart as well as a steady hand is required of the agriculturist before he can work in concert with the engineer. The reaping machine has now attained such a degree of perfection as to bring it into general use on lands prepared for its reception, and the steam plough is making rapid strides towards perfection, and is likely to take the place of horses, and effect a change as beneficial to the farmer as it will be advantageous to the public at large.

ELECTRIC TELEGRAPHS.—The consummation of telegraphic communication between the old and new worlds is the crowning triumph of the age, and I hail, in common with every lover of science, the immense benefits which the successful laying of the Atlantic cable is calculated to secure for mankind. It is another step forwards in the great march of civilisation, and the time is not far distant when we shall see individuals as well as nations united in social intercourse through the medium of the slender wire and the electric current. These are blessings which the most sanguine philosophers of the past never dreamt of. They are the realisation of the age in which we live, and I have to congratulate the section on what has already been done, and upon the benefits yet in store for us in the wide, and, to some extent, unexplored field of this wonderful discovery.

TELEGRAPHIC CABLES.

The following is an abstract of a paper on the construction of Telegraphic Cables, read by Mr. Macintosh, before the same Section:—

insulating material, by means of rollers, each roller is placed in its periphery, the grooves meeting to form an eye of the size of the covering desired. Against the rollers are placed the hoppers, in which the insulating material is placed in warm plastic state. The gutta percha enters the grooves of the rollers, and where the rollers meet together the insulating material in the grooves is pressed together, firmly enclosing the conductor. The whole is then straightened, and the conductor is strengthened by embedding fibres of flax, hemp, or cotton, in an insulating material. This is done with

great pressure, which prevents the possibility of the insulating material ever separating. The cables so made are all cold vulcanised, by passing them through chlorine of sulphur and a solvent, or through sulphuric acid and water, as they are made; this process thoroughly closes up the pores, and rendering the cables much less liable to be injured by heat or abrasion, and effectually preventing the decomposition of the gutta percha or India rubber.

In submerging these cables, they are passed through a canvass tube full of hard wood balls, and attached to the stern of the paying-out vessel by strong vulcanised India rubber springs, which prevents any injury to the cable in depositing it in the sea.

As these cables are made by machinery, they can be made in hundred-mile lengths or more without joints.

LEEDS EXHIBITION OF LOCAL INDUSTRY.

The following is a notice of some of the articles shown in the mechanical division of the Leeds Exhibition of Local Industry, read before the same section by Mr. Joshua Buckton:—

On entering the shed specially set apart for such things, we notice a fine collection of malleable iron, boiler plate, and angle iron, as used in shipbuilding, from the Mast Bridge Works; locomotive crank and other axles from the forged and finished state, from the Clarence, the Leeds, the Farnley, and the Kirkstall Forge Company's Works; many wheel tyres with their uses shown in various forms, and fractures showing the grain and quality of the metal.

In the stand of the Kirkstall Forge Company is seen a beautiful model of a weighing crane, designed for raising and weighing heavy goods at one operation, thereby saving time and an immense amount of labour; the weighing being accomplished by a peculiar and simple adaptation of the principle of the steel yard. The apparatus can be disengaged, and the centres relieved of their weight by a locking movement acted upon by a lever; the crane then becomes an ordinary lifting crane.

Naylor's double steam hammer, also manufactured by the Kirkstall Forge Company, which need not be further mentioned here, as the inventor will himself read a paper on the same before this meeting. It is, however, an important feature in the Exhibition for me to put without notice.

In the machinery room we find a fine collection of engineers' tools, the manufacture of which has now become a most important branch of our local industry, the work of Leeds now ranking among the first in the empire in this peculiar branch. Most of the machines in this class will be found substantially built, exceedingly well put up, and the quality of casting admirable. A lathe is turning irregularly formed pieces of wood, and an endless tape saw, by Greenwood and Battey; and the beautiful adaptation of Combe's expanding pulley in the drilling machine of Joshua Buckton and Co., are well worthy of notice; of Combe's expanding pulley no more need be said here, the inventor having himself read a paper on it showing its applicability to various purposes.

The woollen cloth dressing machinery, by Kempe and Co., should not be left unnoticed, though, perhaps, it may possess more of a local than general interest. Taylor's Corn Mill, with the upper stone stationary, the lower one revolving, is remarkable for simplicity and compactness of arrangement. They can be taken up and put down with great facility by the commonest workman, with the aid of a wrought-iron portable crane. Their smoothness of motion, nicest accuracy of adjustment, and simple movements, render them easy to manage, and not liable to much wear and tear. An improved quality of work is obtained by the centrifugal force imparted to the stone being ground by the revolving under-stone, in clearing them of the ground substance, also producing a thorough draft or ventilation, thereby grinding at a lower temperature. The stones are 2 feet 8 inches and 3 feet

diameter, weighing 3 to 5 cwt. each, versus 15 to 20 cwt., the weight of ordinary millstones. They are effectually driven by a $4\frac{1}{2}$ inch belt, which entirely dispenses with all foundations, and materially reduces the cost of masonry; they stand complete in a self-contained frame, and may be placed on any floor.

The stationary pumping and other engines by Carret, Marshall and Co., should not be passed unnoticed, being well designed and the workmanship first-class.

Leaving the machinery room and ascending to the south gallery, we find in motion Combe's and Smallpage's new double-cam power-loom.

In this power-loom all the movements for plain weaving are obtained from one shaft, perfectly balanced in itself, and revolving at half the speed of the crank shaft of the old loom, the internal and external surface of a pair of double cams being made to act on rollers connected with the going part of the loom. According to the formation of the cams, all the movements of the hand weaver may be imitated with the utmost nicety; a blow may be given adapted to the tenderest linen or the heaviest sail cloth, and a frame made to suit the broadest or narrowest weaving. In the shuttle used in the loom, the weft is packed into the shuttle in the form of a hollow roll, and drawn from the internal surface, by which means, for tender yarns, a shuttle may be used half as thick as the common shuttle, and still carrying double the usual quantity of weft; or for carpet and canvass weaving, a shuttle of the ordinary dimensions may be made to carry four times the usual quantity of weft. By using a thin shuttle in conjunction with a dead pause at the back, the throw of the going part may be diminished one-half, and the number of times which the reed will chafe on the warp reduced in the same proportion by the introduction of the loom and shuttle.

The loom exhibited by John Holmes, also in operation, for working ladies' corsets without a seam (as sample shown), is well worthy of inspection. It differs from the ordinary way of weaving, by the yarn being on several filices in small quantities, instead of all being on one beam as in the common loom. A brass belt is attached to it pierced with several holes at certain distances, and moves one-eighth of an inch for every pick of the shuttle. Small pins, four in number, slide in the brass belt at certain intervals, and make different changes necessary for the production of several kinds and shapes of cloth for a corset; and take up or nipers in front of the loom are in the place of a cloth beam, and draw the cloth straight presently, whether the machine is working cloth at either end or straight across. An inspection of this machine is necessary to comprehend its merits.

Milner's card setting machine is also to be seen at work. His new apparatus for preventing the explosions of steam boilers is well worthy of inspection, being entirely self-acting, enclosed in a case under lock and key. The apparatus is shown complete and in section, exposing its internal arrangements.

A working model of Donnisthorpe's wool-combing machine, made one-quarter the size of the original, is well worthy of inspection. Joy and Holt's self-acting hydraulic press, worked by the water from the Leeds Water Works' shaft, for the working of the bellows attached to the organ as by Mr. Holt, should certainly be seen. Similar hydraulic engines are used to blow the large organ in our own Hall.

OPEN COMPETITIVE EXAMINATIONS.

A paper on this subject was read by Edwin Chadwick, before the Section of Economic Science and Statistics.

Mr. Chadwick said that in compliance with the request of the committee, he would begin by stating the results of the practical application of the principle of competitive examinations since the last meeting of the Association

held at Dublin. He would, however, in the first place, recapitulate the chief economical principles involved in this question. The first of these was the application to services of the principle which Mr. Babbage, in his treatise on the Economy of Manufactures, had exemplified as applicable to manufactures or commodities, and which he expressed as the "saving of the labour of verification;" of which Tower-proof marks for fire-arms, Hall-marks for plate, coinage for metals, were examples, serving for the verification of the attainment of given standards. The application of the principle to the public service would often save the expense of appointing two or three persons to perform work that might be better performed by one of assured qualification,—appointing for new work a number of persons, as on boards, on the chance that one might be found specially qualified, and take the lead in the performance of the required service. And the like economy was applicable to private service. Thus, from the collateral or direct application of the principle to the testing of efficient or inefficient schools, the economy to parents, in obviating the almost total loss of their investments in the education of their children—the economy of time, not to speak of greater considerations belonging to the moralist,—to the children themselves would be enormous; for, added to these economies, there was the economy of time to the pupil or the parent in having authentic and definite standards of the required qualifications, and the great economy of time in attaining them effected by the impetus of competition. For the attainment of these economies the mere pass examination, to a fixed minimum standard, was proved to be generally untrustworthy, and often fraudulent. The cram sufficed for the mere pass examination, but with a properly regulated verbal, as well as written, open and public competitive examination, cramming, in Mr. Chadwick's opinion, was impossible. He would now state in answer to the expectation of the section of its need of statistics—that of the chief open competitive examinations publicly and properly notified as open to all comers, they had as yet no recent statistics. There were on the average about twenty writerships given to open competition, and as many medical appointments; then there were about thirty cadetships at Woolwich—in all, perhaps, about seventy or eighty situations annually—which were at present the subject of *bond fide* open competition. The opening of the cadetships of the Engineers and Artillery for the Indian army would give perhaps as many more as at Woolwich. The only competition of this character for the civil service during the last year had been one—only one—for a single clerkship, at the disposal of the Civil Service Commissioners themselves, and described at some length in their last report, with their statement of reasons, the result of prolonged observation, for the principle of their preference for full, open, and public competition, in accordance with the resolutions of parliament, to the nominated competitions which they had been required to conduct. These nominated, or, properly speaking, the close patronage-appointed competitions, appeared to be on the average of three candidates for one place. The vacancies were unnoticed and unknown to the educational institutions or the general public, and the candidates were named by the departments. The results of competitions in which there were both patronage-appointed and open-competition candidates were very much in favour of the latter. Nevertheless, in the face of clear proofs of the benefit it was calculated to confer, it had been determined to suppress the principle of open competition for army commissions, by restricting it to nominated cadets. It was alleged in the House of Commons, by public officers, that there was no intention to do so, but this must be a mistake. Mr. Chadwick dwelt at considerable length upon the importance of the general principle of making all appointments according to merit, and quoted from various reports and other documents to show the evil that had in many cases arisen from following a different

course. With regard to the effect of competitive examination upon the candidates themselves, Professors Galbraith and Houghton, in their published report in respect to the last Woolwich examinations, had stated:—"As a proof of the benefits conferred by the competitive system, we may mention that subjects hitherto neglected, and some never heard of, in Irish schools are now particularly attended to and diligently taught. We may specify English and French literature and certain advanced branches of science, such as mechanics and hydrostatics. The effects of this system on the study in the university are most striking. We have been fellows of Trinity College since 1844, and have never witnessed anything like the exertions to acquire knowledge made within the last two years. The effect on the teachers is no less remarkable than on the learners. We all feel that our honour is at stake in sending forward candidates to these public contests, where the youth of the entire kingdom assemble for competition." This had been corroborated in other reports. The evils resulting from patronage in another branch of public service, diplomatic appointments, were then pointed out, and instances of the incompetence of several who had held high positions were given. This had been particularly the case with regard to consuls, in the appointment of whom there had been great abuses. The French, on the other hand, had adopted securities for the qualification of their consuls, tested by examinations on the principles proposed. A consul should carry with him, for the public service, a knowledge of the legal institutions of his country, and obtain an acquaintance with the legal and municipal institutions of the country where he resides. The French regulations required that the consul should have the diploma of an advocate, which was only obtainable upon real examinations; and, moreover, that he should have a special knowledge of French treaties, and professional ability in dealing with the questions which arose out of their non-observance. Mr. Chadwick replied at some length to objections that had been urged against the system he was advocating, on the alleged ground that its introduction tended to lower the average of the physical qualities possessed by those who obtained appointments, and continued as follows:—"Since we last met the principle has made progress in unexpected directions where it will have important bearings in political relations of the empire; for an act has been passed by the legislature of Canada 'For improving the organisation and improving the efficiency of its civil service,' which act adopts our principle of special qualifications for the service tested by open competition, before a board of examiners, as proposed in England. The principle has also been introduced into Malta, under the auspices of the enlightened governor, Sir William Reid, who reports, 'I continue to be of opinion that the system of giving clerkships under 22 years of age, to those who pass the best examination, is working advantageously for Malta, and the competition created is evidently having the effect of improving the schools.' I am informed that, with others of our administrative reforms, the principle of open competition is under consideration for adoption in Australia. I beg leave to submit that the course taken by the legislature of Canada, as well as that indicated in Australia, is of the highest import for the advancement of economic science and public administration, for the preservation of representative institutions from degradation, as well as for the educational and political progress of the colonial population. The first effect of the principle of open competition is in getting rid of the obstructive operation of great, and in the colonies peculiarly odious, irrelevancies—as I term them. What it would be in this association, if we were, on questions of science, to enter into the professor's theological or political opinions, or those of his parents, if for example, before considering the views of a professor on electricity, which he has deeply and profoundly studied, we were to discuss his views on politics or theology, which he professes not to have studied, but will probably have taken

on credit—as it would be with the progress of science here, so it is, to the extent to which it prevails in public administration. In Ireland how odious is it to see in times when one party is predominant, the services of the engineers or the artillery deprived of the superior qualifications of a graduate of Trinity College, Dublin, because his father is a Protestant and an Orangeman; or, on the predominance of another party, to see shut out a young man of superior acquisitions in engineering science, because, like his parent, he is a Roman Catholic! As we make progress in art and science, greater and greater devotion is required to divisions and subdivisions of labour, and this attention to those subdivisions almost precludes attention to other wide general controversial questions of politics or theology, and almost necessitates their adoption on trust, and makes the perseverance in the adoption of those irrelevancies as tests, the more odiously unjust towards the young. The competitive principle, as testing the qualifications for the specialities of service, avoids all this. In Canada, it must avoid hateful feelings and jealousies of mere race. In Australia it will assure the young and best qualified candidate, that if, upon the prolonged probation—which is the adjunct of our principle—his own conduct displays his purification, he shall be as little prejudiced by his antecedents as if he were a descendant of one of our greatest historical scoundrels and traitors—amongst whose descendants, or such of them as remain to show—as many of them do show, is an exemplary manner, the purifying influence of the time and civilisation—our great historical depicter of their progenitors, Lord Macaulay, is sent to associate. The principle, in its operation in those colonies, is a bonus on moral purification. At the same time, in countervailing noxious anti-social irrelevancies to the proper object in hand—the principle tends, by freeing the exercise of special qualifications from their disturbance, to facilitate those applications of science to the improvement of administration, of which one condition of progress is permanence in their prosecution. The development of the principle of government by the great irrelevancies of general political party principles, as against special qualifications, may be seen on a gigantic scale in the United States. I have received, from very able officers, either of the State or general government, inquiries on questions of administrative improvements, which I have had specially to consider; such, for instance, as the application of sanitary science to the improvement of the population; improvements in the statistics of administration, in which most important fields were opened in America. But, on inquiry as to their progress, I have been informed that they had been ejected by a change of political party, and that the attempt was extinguished. Under such conditions, the introduction of improvements of a scientific character in public administration appears to me to be generally hopeless. The effect of the frequent change of the political chiefs of departments in England is not enough; but in the United States the whole of the office holders—all of one class of permanent civil servants—are dismissed with each presidential change of party, or the entire service of the country is held up as the spoil of party conflicts; and during the short tenure of office those who gain that spoil are led to extend it beyond the time emoluments of their office. According to authentic reports—according to the statements and lamentations of respectable Americans, the friends of progress, in legislative or administrative bodies in the old country, there is so much bribery and corruption; the character of the judiciary as well as the legislation and public administration has been degraded, and on account of their failure a recourse to Lynch law, and vigilance committees and armed violence, has often become a matter of necessity and a reactionary corrective. Now, the course approved by the Canadian legislature, of holding out public offices as prizes for the advancement of education, and for acquisitions in their schools of those qualifications which are equally available for the private and

open professions, and withdrawing the public emoluments as prizes for conflicts of party passion and violence on political platforms, is the best measure for preserving free representative institutions from degradation, and ensuring to that great colony a rate of advance in social as well as political progress which, under the existing conditions of the United States, must be hopeless, unless the contending parties can be brought to consider the principle, to concede to their educational institutions the rewards which they will not yield to each other. For these reasons, and for stimulating and testing the progress of their rising educational institutions, the principle may be solemnly commended to the earnest consideration of all our colonial legislatures as well as to our relations in the United States." After giving instances to show the illusory character of the nominated close competitions, of twos and threes for one office, he said he felt it his duty to represent that the principle was in hostile executive hands, and that it behoved all friends of education and science to exert themselves with the public, and press upon their representatives the necessity of its extension to all junior appointments in every branch of the service, to demand public notification of all vacancies, and an open and fair field, without political favour, for the proved capacities of the country.

HOROLOGICAL INSTITUTE.

A Horological Institute has been established in Clerkenwell, the object of which is to develop the science of Horology, to foster the arts and various branches of manufacture arising out of it, and to stimulate and encourage the production of the best workmanship by suitable rewards and marks of distinction; and to attain these results by the formation of a library, reading-room, and a collection of tools, models, and machinery; also by the delivery of lectures, and the reading of original papers on subjects connected with the art of Horology and the various branches of trade or manufacture connected therewith. A monthly journal is issued by the Society.

PRESERVATION OF ANIMAL AND VEGETABLE SUBSTANCES.

A patent has lately been taken out for effecting this object. The improvements consist in coating animal and vegetable substances with a compound formed of vegetable albumen and a suitable antiseptic material. The coating is effected by immersing the substances to be preserved in the prepared compound two or three times, each coating being dried or set in a current of air before the next is applied. The object of combining an antiseptic agent with the vegetable albumen is to prevent a partial decomposition of the substances occurring before the protective coating is properly hardened. The following means may be adopted for carrying the invention into effect:—Supposing a joint of meat to be the substance to be preserved, the meat (with as much of its blood extracted as possible) is first washed or immersed in water impregnated with acetate of alumina and allowed to drain, it is then suspended by a string, and allowed to descend into a bath composed by placing about one pound of gum adraganthe (or gum dragon) in from one and a-half to two gallons of heated water for about twenty-four hours, straining the solution, then mixing with it a warm solution of about six ounces of gelatine or paste, and finally adding about ten ounces of acetate of alumina, mixing and straining. The meat is kept in this bath for about two minutes, being drawn and moved about in it by the string, it is then taken out and suspended in a current of dry air for about twenty-four hours. The process of immersion, &c., is then repeated once or twice, as may be considered desirable.

ANALYSIS OF METROPOLITAN WATERS.

The Registrar General in his last report makes the following statement:—

The waters supplied to the metropolis have been examined during the month of August by Dr. Robert Dundas Thomson, F.R.S., of St Thomas's Hospital, who found their composition to be as exhibited in the subsequent table. It will be observed that the amount of impurity in each water is less than in any previous month of the year, in consequence of the great dryness of the period to which the analyses refer. A comparison of the present with former tables will show how far the condition of the waters is improving. For the sake of comparison, the composition of Glasgow waters is appended. The inhabitants of that city are not satisfied with the Clyde supply, though much cleaner than that of the Thames, and the water of a Highland lake, approaching distilled water in purity, will soon flow into the city by gravitation.

	Total impurity per gallon.	Organic impurity per gallon.
	Grains, or °.	Grains, or °.
Distilled water.....	0.0	0.0
Clyde, present supply at Glasgow...	9.67	1.08
Loch Katrine, new supply to Glasgow	2.15	0.80
THAMES COMPANIES:—		
Chelsea	15.88	.92
Southwark	16.00	1.98
Lambeth	17.40	1.08
Grand Junction.....	16.40	1.72
West Middlesex	15.36	1.28
OTHER COMPANIES:—		
East London.....	16.68	1.60
New River.....	15.62	1.32
Kent.....	22.60	1.88

This table exhibits the amount of foreign matter contained in each gallon of water expressed in degrees or grains. The samples were all taken from main pipes.

WHITE BRASS, OR UNOXIDIZABLE CAST IRON.

M. Porel, of Paris, has prepared an alloy which has the appearance and fracture of ordinary zinc, but it is as hard as copper or iron, and tougher than cast iron. It may be turned, filed, or drilled, as easily as those metals; does not adhere to metal moulds, and retains its metallic lustre perfectly in a moist atmosphere. This alloy is prepared by melting together zinc, copper, and cast iron. It contains 10 per cent. copper and 10 per cent. iron. This alloy may be used for various purposes in the construction of machinery; it may be made to appear like bronze, either by covering it with a deposit of metal, or by throwing up the copper superficially, and is, therefore, well adapted for casting vases, statues, and other objects of artistic character that are to be exposed to the atmosphere, especially as it is not a costly material.—*Mining Journal*.

Proceedings of Institutions.

GRAHAM'S TOWN (CAPE OF GOOD HOPE).—The third annual report of the Literary, Scientific, and Medical Society, states that the fortnightly meetings have been regularly held, except during the period of vacation from December, 1857, to April, 1858, and lectures have delivered of a varied and instructive kind, on d' literary and scientific subjects. In these lectures culture,—a subject of much interest to the colony—has been brought prominently forward. The current

was begun with increased activity. The introductory lecture was kindly delivered by the Lord Bishop of Graham's Town, to a very large audience, and considerable interest has been taken by the members in all the subsequent lectures. In October and November last, a series of object lessons was given to a number of young persons, by Dr. Edmunds, Messrs. B. Glanville, and McDonald, the design being the illustration in a simple and popular style of the contents of the Museum. The attendance was very favourable, the teachers of several schools having availed themselves of the opportunity to bring their senior pupils to these lessons. Many valuable specimens have been added to the museum, but in consequence of maintaining it on the slender means which the society could afford, the liabilities of the society have considerably exceeded its limited income, and the committee applied a short time ago for pecuniary aid from the government; this application was favourably received by the Governor, who caused to be placed upon the estimates, for the support of the museum, the sum of £150 as an annual grant. The following is a list of lectures delivered:—Mr. McDonald, "On Meteorology;" Mr. Kennelly, "On Music;" Rev. J. Heavyside, "The Merovingian Era;" Mr. Glanville, "Hugh Millers' Work, the Testimony of the Rocks"; (two lectures), Mr. G. Wright, "Retrospect of History;" Mr. W. Young, "Poetry of Mrs. Hemans;" Mr. Kennelly, "Music" 2nd lecture; Mr. J. Standen, "Phrenology;" Mr. Franklin, "Reminiscences of Travel;" The Lord Bishop of Graham's Town, "Introductory Lecture to Session of 1858;" Mr. McDonald, "Moral Philosophy;" Mr. Glanville, "The causes of the present efficient state of Agriculture in Great Britain and other Countries;" Dr. Edmunds, "Our Food, Animal and Vegetable;" Rev. E. Cornford, "Domestic and Social Life of the Ancient Greeks;" Mr. Tudhope, "Agriculture." An Art exhibition has been lately held in the society's-rooms, embracing an extensive collection of pictures, engravings, and articles of virtu, which has attracted much attention in the colony.

LEEDS (CHRISTIAN INSTITUTE).—On Tuesday evening, 28th September, a soirée in connection with this Institute was held in the Stock Exchange Hall. The Right Hon. M. T. Baines, M.P., occupied the chair, and was surrounded by Sir John Herschel, Sir R. I. Murchison, Rev. Dr. Booth, Dr. Gladstone, Rev. J. Blomefield, Rev. H. R. Reynolds, Rev. G. W. Conder, Rev. W. Guest, Rev. S. Hulme, Rev. J. D. Brocklehurst, &c., &c. The Right Hon. M. T. BAINES, on rising to address the meeting, said he assured them that he had the greatest pleasure in attending there that night for the purpose of testifying the very great respect—the heartfelt respect which he entertained for themselves and for the object which he understood they had in view in that institution—that object, unless he was mistaken, being to enable young men to combine the cultivation of all the graces of a truly Christian character, with the improvement of their intellectual powers, and the attainment of really valuable knowledge. In the course of his address, he observed that that institution, for the superiority of its class instruction and success of its pupils, was found to stand the third in the kingdom according to the Society of Arts' returns. They had eleven pupils who obtained certificates, two first-prize men, one second-prize man, and one of the former who had obtained in addition, at the Oxford Examination, the degree of A. A., and prize of £5 from the delegates of the Oxford Board. These facts, though they lay in a very narrow compass, bore, in his opinion, a most valuable testimony to the operations of the society, and entitled it to the cordial good wishes of all who could appreciate self-denial, industry, and Christian principle. The chairman concluded by introducing Sir JOHN HERSCHEL, who was received with great enthusiasm. He said that when he was invited to attend that meeting, he understood that he should be called upon to distribute the prizes for astronomy to those young men

who had distinguished themselves by their attainments in that science in the Society of Arts' examinations. That arrangement, however, had been very properly altered, and the prizes being considered as distributed, he felt himself at liberty to choose the ground upon which he should address the meeting. As a member of the Society of Arts, his opinion had been requested as to the system of examination, and he gave it most cordially in favour of the proposed scheme; and he stood there, therefore, not merely as a casual visitor, but as one having some more special interest, at least in one part of their proceedings. As a member of the Society of Arts, he must, in the first instance, express his gratification at the well-working of the system in this particular instance; and in the next place, he thought he ought to congratulate the Leeds Young Men's Christian Institution upon the success achieved by several of its pupils in the examination. With these remarks he might proceed, but he should confine his observations to the general testimony which science bore in favour of religion, a testimony which, speaking in the name of science, he had never been backward to give, and which he should never shrink, either on that or any other occasion, from giving. Sir John Herschel then directed his observations especially to the encouragement of those young men who had distinguished themselves in the particular branch of science to which he was himself devoted, astronomy, and concluded by proposing the following resolution:—"That this meeting recognises with pleasure the efforts so successfully made in the Young Men's Christian Association to unite the cultivation of science and literature with the nourishment of true virtue and spiritual religion." Sir R. MURCHISON seconded the resolution, and, in the course of his remarks, said he was anxious to impress upon the members of that Institution the importance of cultivating, as much as was in their power, an acquaintance with geology. He was glad to learn that there was a geological institution at Leeds, and he should be most happy, as director-general of the Geological Survey of the British Isles, to assist that particular Institute by every means in his power. He promised to send to it all the volumes connected with the illustration of the geology of the British Isles which were within his control, and this, he hoped, would prove his good will and sincerity in the cause they were met together to celebrate. The CHAIRMAN then distributed the prizes and certificates awarded by the Society of Arts to members of the Institute. The Rev. Dr. BOOTH, in supporting the motion, observed that he could not recollect any period in the history of this country when so many inducements and so much encouragement were held out to the working and middle classes to promote their own self-improvement. In his opinion, the great work of self-improvement was not to be done for them, but by them. No one would deprecate more than he would the pursuit of mental improvement with the sole object of raising themselves in life, or obtaining any particular situation. They must study irrespective of these considerations, and with a determination above all to do their duty. The Rev. H. R. REYNOLDS moved the following resolution:—"That this meeting heartily welcomes the delegates now present from the Young Men's Christian Associations of Great Britain and Ireland, and extends its cordial Christian sympathy and best wishes to the Associations they represent." The Rev. J. BLOMEFIELD seconded the resolution, and the meeting was afterwards addressed by the Rev. T. H. Tarlton, Dr. Gladstone, the Rev. J. Brocklehurst, the Rev. S. Hulme, and Mr. W. E. Ship-ton. Mr. T. A. PANE moved, and Mr. DAWKINS, of Wisbeach, seconded, a vote of thanks to the chairman which was duly acknowledged, and the meeting then separated.

LEEDS (MECHANICS' INSTITUTION).—A soirée took place in the Leeds Town Hall, on Wednesday evening, the 29th ult., under the auspices of the Mechanics' Institution and Literary Society, at which were distributed the

prizes and certificates of the Society of Arts awarded at the late examination to students from that Institution. Long before the hour fixed for the meeting the hall was crowded in every part. Lord Goderich occupied the chair, and amongst those present were the Earl of Carlisle, Sir R. I. Murchison, Sir P. Fairbairn, Sir C. Nicholson (Provost of the University of Sydney, Australia), Right Hon. M. T. Baines, M.P., Professor Owen, Mr. R. M. Milnes, M.P., Professor Phillips, Professor Hennessy, Dr. Norton Shaw, Rev. Dr. Booth, Rev. Dr. Hook, Mr. E. Chadwick, C.B., Admiral Fitzroy, F.R.S., Admiral Grace, Dr. Lee (President of the Meteorological Society), Mr. Ald. Oxley, Mr. Ald. Bateson, Mr. Ald. Blackburn, Mr. Ald. Botterill (President of the Institution), Mr. Ald. Kelsall, Rev. C. P. Chretien (Oxford), Rev. H. R. Reynolds, Rev. G. W. Conder, Rev. J. H. Ryland (Bradford), Mr. E. Baines, Mr. J. Hole, &c., &c. The CHAIRMAN said, he had little doubt that many of whose who attended the last annual meeting of the Leeds Mechanics' Institution would have thought that that meeting was likely to have been one of the most memorable that ever was held in connection with this body; for it was difficult to have supposed that anything could have equalled that assembly, presided over by Lord Brougham, a man eminently distinguished as a friend of science, a statesman, and a lawyer. He thought, however, that no meeting of this Mechanics' Institution, or, indeed, of any other, had ever been held under more favourable auspices than this; for that evening, the objects of the Leeds Mechanics' Institution were sanctioned by the presence of some of the most distinguished men, he would not say of England, but of the civilised world, who had consented to be present on this occasion, in order that they might show that they, at all events, were hearty approvers of the work in which Mechanics' Institutes were engaged. With regard to the present state of prosperity of the Institution, he found that the Leeds Mechanics' Institution was possessed, at the present moment, of 1,600 members, and that its yearly income amounted to the large sum of £3,000. Besides these, there were no less than 90 scholars in the boys' school, 60 pupils in the boys' evening class, 80 scholars in the ladies' educational institution, and 30 in the ladies' evening class; so that they would see that the benefits of the Institution extended to a very wide circle indeed. In addition to the pupils of whom he had spoken, there were connected with the Institution no less than 2,200 persons, the pupils of the School of Art. There was no doubt that the Institution was doing its work efficiently, and the best practical proof that could be given of this was the distribution of certain prizes which had been won by the members of this Mechanics' Institution in close competition with the other institutions of the country. In spite of this, however, he found that in order to carry out their extensive operations, the managers had been obliged to incur debts. He had been requested, however, to take this opportunity of informing them that it was intended, next year, to hold a bazaar for the benefit of this Institution, and that that bazaar was to be held under the patronage of Her Majesty the Queen. His lordship then alluded to the Royal visit to Leeds, and expressed his opinion that no one who had been present on that occasion, and had seen the order, the good temper, and the loyalty which were displayed by the half-million of the working classes who then thronged the streets—no man who witnessed that most glorious and striking scene, could have doubted, if he had compared it with such visits in former times, that there had been the working of some potent influence and some elevating improvement upon the people of this county; and he could not doubt that among them one of the most powerful had been the spread of education. To that work Mechanics' Institutes had materially contributed, as well as those other gratifying circumstances which they had lately witnessed—that fortunate union among all classes, that happy intercourse and good feeling and mutual

confidence between employers and employed which had been spread of late far and wide.—The Earl of CARLISLE proposed the following sentiment:—"Success to the Leeds Mechanics' Institution and Literary Society, and all similar societies, as they materially promote the development of the chief sources of intellectual cultivation." He would not himself speak on the subject of Mechanics' Institutions, but what he had to say would be entirely of a local and personal character. He had himself followed the fortunes of the good town of Leeds, as well as of the cluster of sister communities which formed the West Riding, and although they undoubtedly had been of a chequered character, as the gleams and shadows of peace and war, of panic and activity, had alternately flitted over them, yet the whole result conveyed to him was that of increasing enterprise, of triumphant industry, and of growing greatness. Above all, he had rejoiced to perceive the evidences of moral progress, as it had been testified by the encouragement given to education, by the multiplication of Mechanics' Institutes, literary societies, and schools of art, by the added facilities for public worship, and by the spirit of order and obedience to the law which had distinguished these swarming hives of industry.—Sir R. I. MURCHISON seconded the resolution, particularly alluding, in the course of his address to the meeting of the British Association at Leeds. The Rev. Dr. BOOTH spoke upon the sentiment—"That the present movements in education tend to encourage the working classes to promote their self-improvement." He remarked that when they had previously discussed the question, how Mechanics' Institutes were to encourage self-improvement, their arguments were little better than reasons in support of a speculative theory, which theory was now no longer such, but was based upon experimental facts. He should not enter into the discussion of the arguments by which this system was recommended, not only as supplying a number of young men, highly cultivated for the public service, but still more as affording the greatest possible stimulus to national education. He would, however, in his anxiety for the success of this measure, address to them one or two cautions. First, they might examine too much, because the processes of the mind in acquiring knowledge were directly opposed, he might say, to those for its manifestation; and, therefore, he should shrink from seeing the system of examination extended to very young boys. He would also press upon them another caution, strongly advising them that if they had laid a sound foundation of elementary knowledge, they should endeavour to build upon it some massive and simple structure, dedicated to one or two departments only of intellectual worship, instead of attempting to embrace too many subjects, which would only lead to their knowledge being superficial.—Mr. CHADWICK supported the resolution.—Lord GODERICH then proceeded to distribute the medals awarded by the Department of Science and Art. His Lordship next distributed the prizes and certificates awarded by the Society of Arts to successful candidates at this year's examination.—Professor OWEN then proposed the following sentiment:—"The advancement of science—to the steady pursuit of which Britain owes much of her elevation among the nations of the world;" this was seconded by Sir Charles Nicholson, provost of the University of Sydney, and late Speaker in the Legislature of New South Wales. He said he had, for upwards of twenty years, been connected with an institution similar to the Leeds Mechanics' Institution in a very remote part of the world—he alluded to the Mechanics' Institution of Sydney—an Institution which, when he first joined it, did not number more than 20 or 30 members, but now comprised 1,200 or 1,300. For this reason, as well as for the deep interest which Australian colonists must feel in all that related to Leeds, he had been induced to take part in that meeting.—Mr. R. M. MILNES M.P., proposed the next sentiment:

THE SOCIETY

with increased activity. The Lord Bishop kindly delivered by the audience, and ce Town, to a very large audience, and ce est has been taken by the members in t lectures. In October a number of subject lessons was given to a B. Glan by Dr. Edmunds, Messrs. illustration i ld, the design being the Mu of the the ular style of the contents of the teache nce was very favourable, as of the e lessons. having availed themselves to the r their senior pupils to these ecimens have been added on the slen uence of maintaining it on the liabiliti ociety could afford, the limited considerably exceeded its limited nittee applied a short time ago ived by the Governor, who caus of th estimates, for the support The £150 as an annual grant. The tures delivered:—Mr. McDonald Glan r. Kennelly, "On Music;" Re. rovingian Era;" Mr. Glan York, the Testimony of the of the Ar. G. Wright, "Retrospect Young," "Poetry of Mrs. J. "Music" 2nd lecture; Mr. J Mr. Franklin, "Reminiscer Bishop of Graham's Town Session of 1858;" Mr. McJ Mr. Glanville, "The cau of Agriculture in Great Dr. Edmunds, "Our F Rev. E. Cornford, "D Ancient Greeks;" Mr Art exhibition has been embracing an extensi and articles of virt tion in the colony.

LEEDS (CHRISTY

28th September, 1891
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Journal of the Society of Arts.

FRIDAY, OCTOBER 15, 1858.

WRECKS AND CASUALTIES ON AND NEAR THE COASTS OF THE UNITED KINGDOM.

The Board of Trade has lately published its report under this head, compiled from returns received from the officers of the Coast-Guard, and receivers of wrecks, stationed on the coast of the United Kingdom.

The wreck experience of the year is stated to be *favourable*, but nevertheless the wreck chart, on which are laid down the localities at which the losses and casualties have occurred, and facts stated in the report, exhibit a state of things calling for serious consideration.

The tables show that there were wrecks and casualties, on and near the coasts of the United Kingdom, to the number of 1,143, representing a tonnage of 218,570 tons, and employing 9,819 hands. Of these 1,143 ships, 923 were British, and 220 foreign. The months in which the casualties took place are given as follows:—

	Vessels.
January	281
February.....	64
March	166
April	76
May	33
June	34
July.....	33
August	75
September	66
October	135
November	94
December	86
Total.....	1,143

The whole of the wrecks and casualties for the year are thus classed:—

Ships totally lost, exclusive of those lost by collisions	384
Totally lost in collisions	53
Seriously damaged	482
Damaged seriously in collision	224

Total..... 1,143

Thus the total wrecks are more than one a-day.

Of the 384 ships totally lost, 205 were wrecked from stress of weather, 66 from inattention, carelessness, or neglect, 84 from defects in the ships or their equipment, and 79 from various causes not classed.

The 482 cases of serious damage appear to have taken place under the following heads:—266 from stress of weather, 86 from inattention, carelessness, or neglect, 38 from defects in ships or their equipments, and 92 from various causes not included in the foregoing classes.

The returns show that of the total number of persons on board ships to which casualties happened, the lives of 2,206 were imperilled, 532 of whom or 24·11 per cent. were lost.

The following is the classification of the certificates held by the masters of the ships:—

Number of vessels commanded by masters holding certificates of competency—(Home trade) ..	79
Do. do. do. (Foreign trade) ..	133
Do., holding certificates of service—(Home trade) ..	198
Do. do. do. (Foreign trade) ..	97
Do. in coasting trade—masters not required to have a certificate	335
Do. commanded by masters, whether holding any and what certificate unknown	108
Do. commanded by foreigners not holding British certificates	198

Total..... 1,143

The report shows that the number of vessels insured was 599, at an aggregate sum of £451,513, but that 84 cargoes only were insured for £21,622; 179 vessels and 118 cargoes were reported uninsured, and of 365 vessels and 741 cargoes it is not known whether they were insured or not; 200 were in ballast. The estimated value of vessels and cargoes reported lost or damaged is stated as follows: 507 vessels, £393,859, cargoes 169, £125,442; total, £519,301. These are but approximations, the information not being complete. The following table shows the employment of the vessels lost last year:—

	Vessels.
In ballast, not colliers.....	138
Coal laden.....	382
Colliers in ballast	62
Cotton.....	8
Fishing smacks	15
Fish or oil	20
Grain and provisions	90
General cargo	85
Iron and other ores	38
Manure and kelp	15
Passengers.....	21
Potatoes or fruit	16
Salt	38
Sugar, coffee, spices, tea, molasses.....	10
Stone, slate, lime, or bricks.....	60

The site of each wreck is given in the chart which accompanies the report, and the following is a list of the principal points at which the casualties have occurred:—

Abertay.....	2	Kish Bank.....	1
Arklow Bank.....	2	Long	18
Barber	2	Long Scar.....	3
Blyth Sands.....	1	Maplin.....	3
Brake	2	Middleton.....	8
Burbo Bank	1	Nash	3
Cardiff Sands.....	1	Newcombe.....	2
Corton.....	2	Owers	2
Dogger Bank.....	1	Scroby	8
Dudgeon	6	Sunk	3
Galloper	4	Shipwash	5
Goodwin	18	Swin	1
Gunfleet	5	Tetney	1
Hasborough	4	Whitburn Steel	1
Herd	10	Whiting.....	1
Holm.....	10	Woolpack.....	1
Kentish Knock	3		

The table below shows the wrecks and casualties for 1857, compared with the five preceding years:—

Description of Casualty.	Total No. of Wrecks reported in the years						Total No. in 5 Years.	Average.
	1852.	1853.	1854.	1855.	1856.	1857.		
Wrecks	958	759	893	894	837	866	5207	868
Collisions	57	73	94	247	316	277	1064	177
Total.....	1015	832	987	1141	1153	1143	6271	1045

From this Table it will be seen that the wrecks and strandings reported in 1857 show—

A decrease of 9·6 per cent. as compared with 1852.
An increase of 14·1 per cent. as compared with 1853.
A decrease of 3·02 per cent. as compared with 1854.
A decrease of 3·02 per cent. as compared with 1855.
An increase of 3·47 per cent. as compared with 1856.

And that the Collisions reported in 1857 show—
An increase of 385·96 per cent. as compared with 1852.
An increase of 279·45 per cent. as compared with 1853.
An increase of 194·68 per cent. as compared with 1854.
An increase of 12·15 per cent. as compared with 1855.
A decrease of 12·34 per cent. as compared with 1856.

It appears from an inspection of the tables given in the report, that the casualties “on the East Coast during 1857 are 94 in advance of those which occurred on that

coast in the preceding year—or 52·5 per cent. upon the whole number of casualties on the entire coasts—a very large proportion. This may, in some measure, no doubt be attributable to the great number of vessels passing and repassing along that coast; but the chief causes appear to be—the difficult and intricate navigation incidental to the rocks and sands with which that coast abounds, the want of harbours of refuge, and the dangerous system of ‘follow the leader’ constantly practised by colliers and coasters, whereby reference to charts, the use of the lead, and the necessity for laying down courses are neglected.

The report goes on to say:—

“A diminution appears in the number of casualties by collision, viz., 277 in 1857, against 316 in 1856. The usual causes, ‘neglect to show light,’ ‘bad look-out,’ and ‘misapplication or neglect of the rule of the road at sea,’ still predominate largely. Another prominent cause of collision is the difficulty of making out the way in which a ship is standing by the showing of a single bright light. The application of coloured side-lights to sailing vessels, similar to those now used by steamers, will enable a vessel to distinguish the direction in which another vessel is standing, which a single light could never do.

“The means for saving life have received considerable attention and support. There are now stationed on the coasts of the United Kingdom, 66 life-boats belonging to the Royal National Life-Boat Institution, the whole of the coxwains and crews being exercised and maintained at the expense of the Board of Trade, and paid through that Institution. The above 66 boats are in addition to the life-boats belonging to private persons, corporate bodies, and local committees unconnected with the Board of Trade, and to two boats belonging to the seamen at Hartlepool subsidised by the Board.”

The sum of £1049 7s. 5d. has been expended by the Board of Trade, during the past year, for the maintenance of life-boats alone. A new arrangement for giving increased efficiency to this branch of the Service has just been concluded with the Institution, and a sum of £827 15s. 4d. has been paid to assist them in placing some new boats in situations where they were much required.

The rocket and mortar apparatus has been put in a state of efficiency. The whole of the Inspecting Commanders of Coast Guard have been communicated with on this subject, and their recommendations with reference to making such changes in the apparatus as would in their opinion adapt it to the several localities, or as to the placing of new sets of apparatus where none had previously existed, have been carefully considered and in many cases carried into effect with satisfactory results. The method of landing persons from ships in distress by means of the rocket and mortar lines has been much simplified; a uniform plan has been devised and adopted, and directions for the use of the apparatus have been extensively circulated throughout the British and Foreign merchant services. The sum expended by the Board of Trade on this account during the year is £2,751 15s. 11d., and 243 lives have been saved through its instrumentality during the same period. The total sum expended in providing means for the salvage of life on the coasts of the United Kingdom, and as rewards for meritorious services on that behalf, during the year 1857, is £5,020 14s. 3d., which sum includes the amounts already referred to as having been paid in respect of life boats and mortar and rocket apparatus; but it is exclusive of the amount expended in presenting chronometers, telescopes, and medals for individual acts of courage and humanity performed in saving and protecting the lives of persons in distress at sea.

The wreck chart shows by distinguishing marks the stations where the rocket, mortar, and life-boats are placed.

There are 141 life-boats, 66 of which are under the

management of the National Life-boat Association, and 75 under other management.

There are 198 stations where the rocket and mortar apparatus is placed belonging to the Board of Trade, and under the management of the Coast Guard. These are distributed thus: England, 141; Ireland, 34; Scotland, 23.

The number of lives saved were as follows:—

By the Life-boats of the National Life-boat Institution and local bodies	338
By luggers, coastguard-boats, and small craft.....	512
By ships and steam-boats	507
By assistance from shore with mortar and rocket apparatus, ropes, &c.	243
By individual exertion	8

Total 1668

THE SALT TRADE.

The following memorial of the salt proprietors of Cheshire and Worcestershire united under a Chamber of Commerce for the extension and protection of the salt trade, has been presented to the Earl of Malmesbury, Secretary of State for Foreign Affairs:—

“Looking to the present state of our relations with China, and to the changes which may be expected to result from the negotiations now going on there, your memorialists respectfully urge that an opening for British manufactured salt may be obtained at the various trading ports of that vast empire.

“Your memorialists cannot adduce any reliable statistics of the actual consumption of salt in China, but assuming the population at three hundred millions, it must range between one and two millions of tons. Your memorialists know that the Chinese sources of supply yield at present no tribute whatever to British commerce, whilst a most vicious fiscal system, dreaded and detested by the population of China, (a system which free admission of British salt would most effectually destroy,) compels the use of an impure and deleterious article.

“Your memorialists impress on your lordship the vast advantage to be derived by British shipping and British commerce, from additional bulky articles of export to China.

“Your memorialists also point to the success which has attended the partial admission of British salt into India, and although restricted to the single port of Calcutta, one hundred thousand tons are now annually imported there, thus furnishing an aggregate of cargoes for 100 ships of 1,000 tons each, with one hundred and fifty thousand pounds per annum in freight, when previous to the small concession of bonding facility obtained from the East India Company in 1846, no British salt found its way to India.

“Your memorialists are convinced that, independent of the great blessing the poorer natives thus derive from the use of pure salt, the beneficial re-action upon the consumers of sugar and other comestibles in Great Britain is considerable, as it affords opportunities to traders and shipowners of bringing these articles in greater abundance, and at a cheaper rate of carriage to England.

“Your memorialists further observe that, as the balance of trade with China is largely against this country, owing to our heavy imports from thence of tea and silk, it is highly desirable that our means of paying for such necessities should be increased, by shipments of manufactured articles, so as to lessen the necessity for the large drain of specie hitherto required to carry on our trade with China.

“On these important grounds your memorialists would therefore respectfully entreat that free admission of British salt be made a stipulation in our future dealings with the Chinese authorities, a concession which, while

it would bring home to the poorest household in China the palpable superiority of British produce, would also greatly assist in removing those barriers of ignorance and of prejudice which have hitherto been so detrimental to the prosecution of enterprise with the Chinese people; and the most practical illustration that the cheap salt of this country is able to cope effectually with solar-made salt, notwithstanding the freight paid to British ship-owners, is afforded by the fact of what has been accomplished in the Calcutta market."

The same body have also agreed upon the following memorial, to be presented to Lord Stanley, President of the Council for India:—

"That repeated representations have been made by the salt trade, addressed both to the late Honourable East India Company, and to Her Majesty's Government for the time being, upon the benefits likely to attend the full admission of British manufactured salt into the ports of India.

"That under a reconstruction of the fiscal system hitherto existing in India, which may be expected to follow the great political changes that have taken place there, an adjustment of the Salt Duties and extended arrangements for the admission of British salt into India are, in the opinion of your memorialists, objects deserving of especial consideration.

"That the privilege of importing British salt into India was only conceded practically in the year 1846, and it has been so far successful as, gradually, to lead to an import of nearly one hundred thousand tons at the port of Calcutta, where alone facilities exist under which the salt can be bonded and sold.

"That this opening of the Calcutta market establishes the fact of good British salt with the freight added being enabled to compete with native and other Asiatic-made salt, inasmuch as the cheapness and purity of the former more than counterbalances the cost of transit; and hence an additional article of export, affording an outlet to our native manufacture and profitable employment for shipping, has been secured, creating at the same time an additional demand for Indian produce in return.

Your memorialists need hardly point out to your lordship the advantage to a population like that of India having access to a supply of good wholesome salt, instead of being compelled to use the inferior native made salt, which has heretofore alone been within their reach; and your memorialists confidently believe that if bonding facilities are afforded at all the ports similar to those which exist at Calcutta, British salt would soon find its way into every part of India.

"Your memorialists would therefore most respectfully urge, as regards the treatment of English salt, that all Indian ports be placed upon the same footing relatively with the native manufacture as Calcutta, due regard being had to the differential duties which appear to exist in the different Presidencies, and that an early intimation should be given to your memorialists when such extended facilities are likely to come into operation."

The salt trade of Cheshire and Worcestershire comprises some fifty or sixty firms (amongst them several joint-stock companies, in which many hundred thousands of capital have been embarked), who now manufacture upwards of a million tons of salt per annum, affording employment to a large number of labourers and artisans—contributing £50,000 per annum to the River Weaver Trust, besides many thousands to the railways, and a large sum to the Liverpool Dock rates,—capable of almost unlimited extension as regards quantity, and of thus developing a large and valuable property. The salt proprietors contend that it is a trade well deserving the support of the Executive—and that so favourable an opportunity as presents itself for testing the Chinese markets should not be lost sight of—to say nothing of the importance of the question to the shipping of this country. The total export of salt from Liverpool last

year was 624,496 tons, of which 80,312 tons went to Calcutta. This is exclusive of exports from the ports of Bristol and Gloucester.

BRITISH ASSOCIATION, LEEDS, 1868.

ON THE ECONOMY OF WATER-POWER. BY JOSEPH GLYNN, F.R.S., M.INST.C.E.

The following paper was read before the Mechanical Section:—

Although much has of late been done to facilitate and extend the employment of water as a moving power, the worthy president of this section having greatly improved his water wheels so as to obtain an increase of useful effect, and to obviate the drawbacks to which they had been subject, by means of ventilating buckets and other inventions connected with that method of applying water-power; and although several modes of applying water-pressure as a moving power have been much improved, and its use greatly increased by the inventions of Mr. Armstrong, of Newcastle-on-Tyne, for accumulating and distributing the pressure of water for working cranes, for opening dock-gates and bridges, and for other purposes where great power is required occasionally or at intervals; although he has greatly improved the pressure engine, and caused water to do duty instead of steam, and has even economised the surplus pressure of the water as it passes through the main pipe in the streets of Newcastle, causing it to print a daily newspaper before he parts with it, and, as it were, to pay a transit duty to Newcastle on its way to Gateshead, yet much remains to be done in the employment and economy of this great source of mechanical power so beautifully distributed over the three kingdoms.

Those members of this section who visited Paris during the Great Exhibition, would probably observe the various methods of applying water as a motive power which were there displayed, some of them in the form of models, but others as powerful machines intended for actual work, and capable of driving several pairs of millstones.

In this part of England, and in other manufacturing districts where coal is found, the steam engine will generally be preferred to all other prime movers, but in many parts of the British empire, more especially in Scotland and Ireland, coal is scarce and water is abundant, and is too often allowed to run to waste when its application to turn mills and to work machinery for farming purposes might save both time and money, and relieve the people from the burden of hard work that can be better performed by mechanical power than by manual labour.

Those machines produced at the Paris Exhibition, to which the writer would more particularly direct the attention of this section, are the horizontal water wheels, some of which were wrongly named turbines, whereas they were really substitutes for the machines so called.

The turbine is a machine of re-action, on the same principle as Dr. Barker's mill, or that modification of it known as Whitelaw and Stirrat's Water Mill, from which the water issues in jets, and the unbalanced pressure opposite to the orifices impels the machine, and causes it to revolve in the opposite direction, somewhat in the same way that a skyrocket is driven upwards by the force or recoil acting against the closed end of the rocket tube or case.

The name turbine is derived from the supposed resemblance of these machines to a twisted or turbinated shell. The turbines of M. Fourneyron and others are formed on this principle of re-action, having their curved vanes somewhat similar to the twisted shell.

The turbine requires considerable skill in its construction, and careful attention when it is in use; but the horizontal water-wheel is a much more simple machine, and much less liable to derangement. It is not a costly machine, and it requires comparatively little care.

These horizontal wheels are much alike in principle and in plan, although they may and do differ from each other in their details, and they also differ materially from the vortex-wheels which Mr. James Thomson well-described in an excellent paper read before this section at the meeting of the Association in Belfast, illustrated by diagrams showing their construction, which may be compared with that of Appold's pump with its action reversed. The water drives round a fan with curved vanes, having a vertical axis, and revolving in an iron case, the water escaping at the centre.

The horizontal water-wheels in the French Exhibition were much alike in principle and in plan, although they might differ from each other in their details. They generally consisted of two parts or wheels placed horizontally on a vertical axis, one wheel immediately above the other. The upper part or wheel is fixed, and serves to direct the water into the buckets of the lower one, that is to say the real water-wheel, which revolves, and the axle or spindle revolves with it.

If the fall or head of water be but little and the quantity of water large, the machine is generally fixed in masonry, but if the fall be great and the quantity small, it is generally fixed in an iron cylinder, sometimes closed at the top; the water being then brought into the side by an inclosed pipe descending from the elevated sources of the water.

The regulators which determine the quantity of water and the speed of the wheel may vary in almost every instance, some being mere wooden sluices, some being metal plates pierced with apertures like a ventilator, and some of stout leather strengthened with iron plates; the leather being in three pieces, and fitted upon conical rollers radiating from the axis.

Some of these wheels are very powerful and carry a spur wheel upon the vertical axis, surrounded by six pairs of millstones for grinding corn, driven by pinions in the usual way. Other wheels, of smaller size and greater speed, drive a single pair of millstones without the intervention of other mechanism; the axis of the water wheel being also the spindle of the millstone.

The mechanical effect of these machines when carefully made is said to equal that of an overshot or breast wheel. Messrs. Fromont state that some of their making realize 75 per cent. It is somewhat singular that those wheels which some of our engineers and mill-wrights now make for exportation, should not be used at home. The well-known firm of Bryan Donkin and Co., of London, may be mentioned as the principal makers and exporters of the horizontal wheel.

The writer has been induced to submit to the section the waste of water in so many places where it may be turned to profit, from his having recently visited some of the undulating and hilly counties bordering on Wales, where almost every valley has its stream or brook ready to do good service, and the means of making such power available at moderate cost.

ON AN EXPANDING PULLEY. BY J. COMBE.

The following paper was read before the Mechanical Section:—

A pretty correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other.

This will be at once apparent by an inspection of the models or drawings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other,

which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size, will be made evident, by a comparison of the results obtainable by a pair of common cones and a pair of expanders, of similar dimensions, and giving the same extremes of speeds.

A range, from one to four in diameter (or more if necessary), is easily obtainable in the expanders, and supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 inches diameter, and the one which is driven to be set at 16 inches diameter, (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute. When the driver is changed to 16 inches diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320) may be of any extent, or per centage on the speed, and they can be made as gradually as is desired without stopping.

For comparison with this, take a pair of common cones, having the same extreme diameters, and having steps of two inches, which is not more than usual. When the driving strap is changed from the steps on the cones, which give the slowest speed (that is 20 revolutions per minute) to the next steps, which is the smallest change that can be made, the speed of the driven is increased to 34 revolutions per minute, that is 70 per cent. on the former speed. The change to the next steps makes the speed of the driven 53, and the increase here is 56 per cent. The third change increases it to 80, or 51 per cent. The next to 120, an increase of 50 per cent. Then to 186, by an increase of 55 per cent. And, lastly, to 320, by an increase of 72 per cent. All these changes in speed are great, and although in practice mechanics have become accustomed to them, and don't think of the loss, it is quite clear that a great waste of time must result from not being able to get smaller changes readily. For instance, suppose that a lathe or boring machine has a piece of work in it of a diameter that would require a speed between any of the speeds which the steps of the common cones give, but which will not bear the whole step, it is quite clear that in this case a loss of time and work equal to 50 or 60 per cent. may take place. To get over the difficulty attending the use of common cones, some tool makers use two pairs of driving pulleys on the counter shaft, which of course doubles the range of the cones, but this is a cumbrous arrangement, and is still very far from giving what is necessary or desirable. There are many machines in which a variation of speed is desirable, and would be used if it could be got readily; but there is often such a loss of time involved in making a change that very much slower speeds are used rather than take the trouble or incur the delay of making that change. The common cones referred to are not by any means an extreme case; on the contrary, it is quite common to make the steps even greater, and if the number of steps be less, and the extent of the range smaller, there is of course a corresponding diminution in the adaptability of the machine to different purposes.

The expanding pulley was first brought out for the purpose of giving the varying motion to the bobbins in flax and tow roving frames, to which it is applicable with great advantage, from the accuracy of its action and the small space which it occupies. By its use a very simple and correctly working machine is got, capable of making bobbins either in the ordinary way or in cops. It is equally applicable (as the cop and bobbin exhibited will testify) to the heaviest and the lightest frames.

The cop is from a tow roving frame, and is made of rove weighing 1 lea (or 300 yards) to the pound. The bobbin is filled with flax rove of 40 leas (or 12,000 yards) to the pound.

On the machines on which this bobbin and cop were filled, only one expander is used, and the band is kept at the necessary tension, either by making the expander swing in a frame, or by the use of a stretching pulley.

A very simple mode of applying a stretching pulley is to make the pulley, which does not vary, with two grooves or V's, and pass the band twice round it, putting the expander in one fold, and the stretching pulley in the other. These arrangements are applicable to many other purposes. Where two expanders are used one to drive the other, it is not necessary to have any stretching pulley, but simply to connect one or both sides of each pulley with levers, so that they may be moved simultaneously as required.

The purposes to which these cones are applicable are innumerable, and being simple and inexpensive, there is every reason to expect that when known, they will be almost as extensively used as common flat pulleys. It is thought by many that V pulleys and bands for driving purposes are objectionable, but there is some prejudice in this idea. If a round or square band will convey the power, last as long, and not be more costly than a strap, where are the objections? It has been long known that round gut bands can convey great power, and their durability and economy soon speak for themselves. There is a gut band here which was in constant use on a 60 spindle roving frame for seventeen months, and it is as good now as when it was put on, or nearly so. In such a frame, made in the ordinary way with two cones, a strap 2½ or 3 inches broad would be used.

From the great range in size which can be got with these pulleys, and the keen bite which the bands take, they are exceedingly applicable to tools of all kinds.

As an instance, a drilling machine made by Messrs. Buckton and Co., in the "Exhibition of Local Industry," now open in Leeds, may be referred to, in which, by means of a pair of these pulleys, which can be changed from 4 to 16 inches diameter, any variation of speed can be got at once from 20 to 30 revolutions per minute, or other range in a like proportion. In this machine the usual bevel wheels are made two to one in place of being equal in size, and it has no other gearing; it will, however, do nearly as great a range of work as double-gear machines of similar size. The cost is less, and the facility of change much greater.

To lathes it is equally applicable, and its peculiar adaptation to those for surfacing will be obvious.

A governor driven by it can be made to regulate an engine or water-wheel at any desired speed without stop or trouble.

It is also extremely well adapted to give the varying speed required in weaving machines, such as dressing, warping, and winding machines, and for positive giving-out and taking-up motions in looms.

These pulleys have now been in use extensively for about two years for roving frames, and can be spoken of with confidence as to their performance and value. For most purposes a round band answers very well, but where a considerable power is wanted to be transmitted, bands formed of two or more thicknesses of leather can be used.

In conclusion, it may be stated that the liability to accidents is very much diminished as it is not necessary for the attendant to touch the band while changing the speed.

ON THE APPLICATION OF COMBUSTIBLE COMPOUNDS TO BE USED IN WAR. BY J. MACINTOSH.

The following is an abstract of a communication read before the Mechanical Section:—

This paper relates to the use of coal tar, naphtha, or other hydro-carbons, alone or in combination with other materials, to be used as an agent in attack and defence; also to the application of hydro-carbons mixed with gunpowder, and brought to a plastic state by means of India-rubber or other gums, and fibrous materials, introduced into shells and other missiles; also in filling shells with

coal-tar naphtha, containing potassium, for igniting when used in water, and in filling shells with coal-tar naphtha, mixed with phosphorus and bisulphuret of carbon, with bursting powder sufficient to open the shells.

To attack fortresses from seaward, an artificial dense and dark fog is generated, capable of being prolonged at pleasure, in front of the batteries to be attacked, which renders them untenable, enabling the attacking vessels to approach and destroy the works, unmolested by any hostile fire.

The diaphragm shells, filled with naphtha, phosphorus, and bisulphuret of carbon, may be used with great effect against cavalry and troops, as the bursting of the shell scatters the contents in all directions, causing their immediate disorganisation and destruction. When a shell containing the combustible material bursts in earth-works, the earth, being porous and incombustible, prevents the combustion from spreading rapidly, but allows the black vapour to ooze out gradually, causing most serious annoyance to the enemy, who are unable to extinguish the suffocating fog, and are hindered from carrying on their operations.

It may be brought to bear with most satisfactory results against an enemy encamped in tents.

PLAN FOR GIVING ALARMS IN PASSENGER TRAINS. BY J. O'NEIL.

The invention consists of an iron bar extending under each carriage, and suspended on a pin a little from the centre, so as to make one end heavier than the other.

The heavy end is securely held in a bridle, by a hanging latch at the end of the carriage.

The light end also passes through a bridle at the other end, and has a tongue which draws out from the bar, and reaches under the latch fixed on the next carriage.

By disengaging any of the latches, the heavy end falls; and the light end, in rising, throws up the next latch, and so on to the guard's van, where it rings an alarm.

A chain or wire, fixed to the latch and brought into the carriage, gives each passenger, in the event of danger, the means of giving a signal to the guard; and a duplicate set of bars, on the other side of the carriage, enables him instantly to communicate with the driver, if necessary.

The end of each tongue has a rising point, rivetted loose, so that the porter, when coupling the carriages, could put it in position for disengaging the latch, in case the carriages should become detached by the breaking of the coupling chains.

As the bars are not connected, any number of carriages can be taken off or put on at a station, by merely turning the loose point on the end of the tongue up or down.

ON SOME OF THE RESULTS OF THE SOCIETY OF ARTS EXAMINATIONS.—By JOHN POPE HENNESSY, of the Inner Temple.

The following paper was read before the Section of Economic Science and Statistics:—

The system of examination established by the Society of Arts is well known. I do not propose referring to it further than to remark that it is intended to operate among the working classes; that no students of any of the learned professions, no graduates or undergraduates of any university, no certificated schoolmasters or pupil teachers are eligible for examination. Nor is any one qualified to present himself as a candidate who is not a member of, or a student of a class in, one of the many Institutes in all parts of the United Kingdom in union with the Society of Arts. In this way it becomes a test of the influence of institutional education. In fact it is the only direct and unequivocal test of that valuable class of education which we possess. Statistics of an in-

Name of District.	Average School-period.
Banbury	5 years 9 months.
Berkampstead	6 " 9 "
Blackburn	4 " 0 "
Bradford	4 " 3 "
Brighton	8 " 0 "
Bristol	6 " 8 "
Halifax	5 " 0 "
Ipewich	6 " 8 "
Leeds	5 " 10 "
Liverpool	6 " 2 "
Eastern District of London ...	6 " 2 "
Western District of London ...	7 " 6 "
Louth	6 " 3 "
Macclesfield	5 " 0 "
Manchester	5 " 8 "
Oldham	6 " 6 "
Portsmouth (Portsea)	4 " 3 "
Selby	7 " 8 "
Sheffield	5 " 6 "
Stockport	4 " 6 "
Wakefield	6 " 6 "
Wigan	5 " 8 "
York	7 " 3 "

SOLID INK.

M. Leonardi, of Dresden, has invented an ink which he calls "Alizarine Ink," which he can form into cakes for convenience of transport. Liquid inks, hitherto formed into cakes by drying and evaporating, cannot be brought back to the liquid state again satisfactorily. The inventor takes forty-two parts of Aleppo galls and three parts of Dutch madder, and infuses them in a sufficient quantity of hot water. The solution is then filtered, and one and a half parts of sulphate of iron are dissolved in it, after which two parts of acetate of iron, and one and a fifth part of liquid sulphate of indigo are added. The whole is then evaporated to dryness, and the residuum is moulded into cakes.

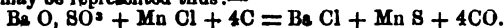
One part of this dry ink dissolved in six parts of hot water gives, says the inventor, an ink of first-rate quality, and one of good quality may be obtained by employing one or fifteen parts of water to one of solid ink.

MANUFACTURE OF SALTS OF BARYTA.

A communication on this subject, by M. Frederic Kuhlmann, has recently been laid before the French Academy of Sciences, in which the author, after speaking of the important sanitary considerations involved in the subject, states that the experience of several years in his manufactories has enabled him to surmount many of the difficulties which at first stood in the way of the economical production of these salts.

The first object he had in view in his experiments was to lessen the cost of the acids, which form an important element in their manufacture, and to this end he endeavoured to condense more effectually the acid vapours, which usually escape to so large an extent in the works where a salt is decomposed by heat. This is effected by making them pass over native carbonate of baryta. The chloride of barium thus formed is converted into sulphate by the addition of sulphuric acid, the hydrochloric acid given off being again condensed and utilized. A large portion of the same acid, in combination with manganese, had also been hitherto unavoidably lost in the manufacture of chloride of lime, and many experiments had been made with the view of utilising the chloride of manganese thus wasted, but with very partial success. M. Kuhlmann, however, states that by a process which he describes, he is enabled to make use of this substance for the conversion of native sulphate of baryta

into chloride of barium. Certain proportions of the native sulphate are mixed with chloride of manganese and charcoal, and after exposure to a very high temperature for some considerable time, insoluble sulphuretted of manganese is formed, together with chloride of barium, which may be easily separated by washing. The reaction may be represented thus:—



The chloride of iron, which is generally found mixed with the chloride of manganese, undergoes similar decomposition. The charcoal acts as a deoxidizing agent, and is converted into carbonic oxide. Only 3 or 4 per cent. of the sulphate of baryta is said to be lost in this process.

M. Kuhlmann mentions that in repairing a furnace which had been employed in this operation, a blue substance, containing neither soda, manganese, nor cobalt, had been found, and he is of opinion that this is a kind of ultramarine in which the soda is replaced by baryta.

The production of artificial sulphate of baryta from the chloride of barium obtained in the manner described above, is effected by precipitation from the watery solution of chloride. After this has been purified, diluted sulphuric acid is added to it till no further precipitate takes place. The supernatant liquid is then drawn off by a syphon, and the precipitate, after being thoroughly washed, to remove any trace of free acid, is compressed into a paste, in which state it becomes an article of commerce. The author states that he now produces at his works as much as 2,000 kilogrammes per day, and that it has been much used in various kinds of painting, distempering, and whitewashing, and he is of opinion that as it enters slowly into very intimate combination with the soluble alkaline silicates, it may serve to facilitate the rendering other pigments permanent, as well as to form a remarkably pure white paint, not liable to be acted upon by sulphuretted hydrogen.

Proceedings of Institutions.

BRADFORD (MECHANICS' INSTITUTE).—A soirée was held at this Institution, on Thursday evening, the 30th September, when the prizes and certificates awarded at the last examination of the Society of Arts were distributed. Tea was served in the news-room at half-past six o'clock, and the company afterwards adjourned to the lecture-theatre, where the Rev. J. H. Ryland, president of the Institution, took the chair at eight o'clock. R. Monckton Milnes, Esq., M.P., was present as an invited guest, and among other gentlemen on the platform were the Mayor of Bradford, the Rev. Dr. Goodwin, W. E. Forster, Esq., Alfred Harris, junr., Esq., — Tyler, Esq., J. V. Goodwin, Esq., Edward Kenion, Esq., the Rev. W. R. Smith, Dr. Brereton, and Messrs. Farrar, sen., Mills, and Yewdall, members of the Town Council. The President, in stating the objects of the meeting, made some remarks on the beneficial influence which the Society of Arts' examinations are likely to exercise upon Mechanics' Institutions, by giving them increased vitality, and adapting them in a greater degree to the wants of the people. He adverted to the meeting of the British Association at Leeds, and intimated that Bradford might hope to be honoured by a visit from that august body at some future time. When that time should come, he trusted it would be shown that, as Bradford, in its material interests, had far outgrown any other town, so it must take a foremost rank in the achievements of science and intellectual cultivation. The number of members of this institution had not been this year quite so great as in former years, owing to the depression of trade. Still he believed they reached about 1,200 in number. The number of books in the library was upwards of 7,000. The President then distributed the prizes of books awarded by the Institution

to the attainments of the pupils in its own classes, according to the system which was commenced in 1847 and had been regularly followed down to the present year. The award of these prizes was the result of examinations by the members of the direction and others. With reference to the Society of Arts' Examinations, the President stated that at the preliminary examination, 22 candidates, members of the Bradford Mechanics' Institution, presented themselves, of whom 18 satisfied the requirements of the Local Board. Of the 18 candidates who were examined by the papers of the Society of Arts at the final examination, 17 were successful, and received certificates.—Mr. ALFRED HARRIS, junr., Chairman of the Local Board, then distributed the certificates. Special prizes, proposed by himself, were also distributed by Mr. Harris, to three candidates in drawing.—The President said he had received a letter from Mr. Lobley, the teacher of the drawing class, stating that the pupils in that class desired to return thanks to Mr. Harris for his generosity, encouragement, and advice during the past year. The Mayor briefly proposed the first resolution:—"That this meeting congratulates the members and friends of the Bradford Mechanics' Institute on the return of the winter session, as affording, in its various departments, renewed opportunities for the diligent acquisition of knowledge; more especially in the classes department, the importance and results of which have this evening met with public and appropriate recognition."—Mr. R. MONCKTON MILNES, M.P., seconded the resolution, and, in the course of his speech, offered some useful suggestions on the attainment of scientific knowledge by members of Mechanics' Institutions. Science was nothing but an active and careful examination of the works of nature around us. There was not one member of that Institution who did not come into contact with the operations of nature in one way or other in his various employments. By a careful study of those operations of nature, the first step in science was gained, and if they went from the operations of nature to those operations of applied science which were at the foundation of the great manufacturing processes in this country, they would then have learnt those principles of mechanical science which would lead them to subjects of the highest interest. Mr. Milnes said that the best thing which men of science could do to encourage the study of science in this country would be to simplify their vocabularies; but the two immense impediments to scientific inquiry were over-work and over-play.—Mr. W. E. FORSTER moved the next resolution:—"That this meeting desires to call the special attention of the members of the classes to the progress which the Society of Arts' scheme of Examination has made during the past year; and trusts that the success of this Institute in the recent examination may stimulate the pupils in its classes to increased exertion, in preparing for a similar examination in 1859." In reference to the Society of Arts' Examinations, Mr. Forster said that the success achieved by the candidates belonging to the Bradford Mechanics' Institution was greater than the average throughout the United Kingdom. He heartily congratulated them on that result, and hoped that next year it would be still more favourable. The Rev. Dr. GODWIN briefly seconded the resolution.—Mr. EDWARD KENION moved "That the members and friends of the Institute again express their great obligations to all such as give it the benefit of their gratuitous services in the instruction of its classes."—Mr. HANSON seconded the motion.—Mr. J. V. GODWIN moved a vote of thanks to the President, for his conduct in the chair; the motion was seconded by Mr. FARRAR, and carried with acclamation. The proceedings of the meeting were interspersed with vocal music, by Mr. Sunderland, Miss Newbound, and Mr. Briggs: Mr. Jackson presiding at the pianoforte. The whole concluded with "God save the Queen."

CROSBY-HALL EVENING CLASSES, LONDON.—On Thursday evening, September 30th, a public meeting of the members and friends of the Evening Classes for Young

Men was held in Crosby Hall, Bishopsgate-street, with the special object of distributing the certificates and prizes which were awarded to the members of that Institution by the Council of the Society of Arts, after the Examination in May last. The chair was occupied by T. Winkworth, Esq., one of the Vice Presidents of the Society of Arts; and he was supported by the Revs. F. G. Blomfield, Thomas Hugo, R. M. Martin, Dr. Zerff, D. Henkema, Esq., the Honorary Secretaries, &c. The Priseners also had seats on the platform. The Chairman expressed his regret that no more distinguished person occupied the chair on that occasion, though he felt great pride and satisfaction in representing the Society of Arts. He took the strongest interest in the operations of this Institution, which had earned so many certificates and so many prizes; and he had no doubt that the company present would make allowances for him if he failed in properly conducting the business of that evening, though he had little apprehension, as he was so well supported by the Committee and acting officers of the Institution.—The report of the proceedings for the last session was then read, from which it appeared that—

At Midsummer, 1857, there was considerable anxiety as to the prospects of the Institution. There was a considerable debt on the Institution, and the tenants of Crosby Hall had notice to quit, as the lease of the building was to be sold. A protraction was accordingly made. Proposals were issued to raise by subscription a considerable sum, with a view of paying off old liabilities, and, if possible, of purchasing the lease. Some changes were made in the constitution of the committee, and an Endowment Committee was also appointed, who, having at apart a sum to pay off existing liabilities, endeavoured to hasten for the lease of the building; but as the price set upon it exceeded their means, they took steps to retain at least temporary possession at the same rent as heretofore. By the means the Institution was set free from its difficulties; and being thus secure as to the payment of its rent for a year or two, and relieved of its heavy incumbrances, it has been able to continue its work. During Michaelmas Term, 1857, there were 677 subscribing members, producing the amount of £262 0s. 6d. The returns of Lent and Trinity Terms were somewhat similar, as may be seen by the following table, only the receipts were not so large, as the Michaelmas account includes members who had subscribed for the whole year:—

Lent Term, 1858: Members, 70; Subscription,	£223 11
Trinity Term, 1858: Members, 60; Subscription,	£160 11

Thirty-three lectures and one elocutionary entertainment were delivered during the year, attended by an average of 200 persons, costing the committee, for incidental expenses, about £10. The Lecturers giving their services gratuitously (to whom the thanks of the committee, the members, and the public, are especially due), and thus realising directly by the sale of lecture tickets, £14 19s. 6d. At the expense of J. W. Gilbert, Esq., F.R.S., a course of lectures was given by Professor Leoni Levi, on "The Principles of Commerce and Commercial Law." The reading-room and library have not cost more than £72, including a sum of £25 paid for books through the liberality of J. W. Gilbert, Esq., and £10 10s. 6d. annual subscription to Mudie's Library. The rent amount stands thus:—

Rent, Rates, and Taxes, for the year 1857—8	£360 11
Less received for lettings of Throne Room, &c.	£163 11

Deficiency expected from Endowment Fund	£207 11
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A day school for boys, under the patronage of the Committee, has also been held upon the premises; at first in a classroom, and subsequently in the Throne-room. It is under the immediate care of Mr. Priestman, and promises well; the number having been for the first quarter, 34; for the second, 45; for the third, 70; producing the sum of £65. This has been expended on the master and a few requisites, but it is hoped that next year something will also be available for the committee close their report by asking and offering congratulations upon the success which several of the members have achieved, with much honour to themselves. At the Examination held by the Society of Arts highly satisfactory results were attained, the members attaining 6 prizes, and 11 first-class, second-class, and 13 third-class certificates; in consequence

Council of the Society of Arts, and, as a Local Board, which have been recognised by the most distinguished candidates of the Council of the Society in H.M. Customs, and before the Civil Service list of 12 candidates, selected by the Commission in all the required Oxford Middle Class Examinations, otherwise favourably known as the only candidate from Crosby in the A, or English Section, giving him the title of Associate member. Other members have won prizes in a department, which some call the cricket-field, the proud pre-eminence among the close of the financial year, weekly a journal of its progress, and this has been

first-class certificates and prizes. Mr. Mackenzie then introduced others who had received certificates, but to whom no pecuniary reward had been accorded; observing that, however agreeable to receive such substantial compliments, the distinction was valuable simply as a distinction, and would be duly prized by the young men present. They were well aware that the civic crown of oak had stimulated the citizens of Rome to earn the approval of their country, and that the ivy and the laurel wreath which rewarded the exertions of the victor at Athens and at Corinth, had ennobled throughout the world those who had received it. With regard to those who had only succeeded in obtaining certificates of competency, he wished to say, in reference to one subject, French, that there might be a reason for the French pupils not having won so much distinction this year as heretofore. The Council had required the knowledge of French history, as well as of the French language; and some of the best scholars, feeling that this was a portion of study to which they had not been introduced, and not willing to incur the imputation of a comparative failure, had declined to appear before the Examiners. Mr. Mackenzie then introduced to the meeting Mr. E. G. Clarke, who was the only one of their members who had presented himself as a candidate before the Oxford Examiners, and who had received the high distinction of being named the very first in class A, or English Literature, together with the title of Associate in Arts. In the present year, having other things in hand, he had not appeared before the Society of Arts, and therefore had not been among the prizemen on this occasion; but the Committee of the Evening Classes wished to testify their satisfaction at his progress. They desired to present him, through the Chairman, with a cheque for £5 5s. They had ordinarily no funds for such a purpose, but an excellent friend, Mr. Gilbert, had indicated that a part of a liberal donation which he gave last year should be appropriated to such a purpose, and the Committee felt there could not be a better use of it. After the Chairman had presented it, Mr. Clarke returned thanks, and expressed his conviction that no man could stand for a few moments on that platform to receive the words of approbation from the Chairman, without resolving still to pursue distinction, and to strive better to deserve the approbation of his friends and neighbours. He then warmly advocated the cause of the "Evening Classes Journal," and asked leave to propose a vote of thanks to the Local Board, who had conducted the preliminary examination, which having been seconded by Mr. Machell, was unanimously carried.—The Rev. R. WHITTINGTON being called on to reply, said, that he placed the greatest value on the preliminary examinations, which it was the duty of the local board to institute; and that he attributed the marked success which their members had obtained, to the honest way in which these examinations had been conducted.—The Rev. F. G. BLOMFIELD desired to express their obligations to the Committee of Management, and especially alluded to the exertions of his friend, Mr. Mackenzie, who had for so many years given so much time, and care, and labour to this work. Accordingly, in terms of high eulogium, he proposed a vote of thanks to the Committee of Management and the Honorary Secretary.—This was acknowledged by Mr. MACKENZIE, who spoke in high terms of the valuable assistance he had received from Mr. Whittington and the Committee, and concluded by proposing a vote of thanks to the Chairman and the Council of the Society of Arts.—In acknowledging the vote of thanks, Mr. WINKWORTH said he would first avail himself of the occasion to assure Mr. Mackenzie that he would not fail to represent to the examiners through the council, the wish of the committee of management to have the conditions of the French examinations revised and the reasons for it. He would next express his entire satisfaction with the business of the evening, which afforded him a treat he

report, the meeting was BLOMFIELD, who expressed his not yet self-supporting, and importance of endeavouring to increase the number of. He also called the special importance of assisting the "Evening Classes' Journal," recently conviction was, that it was a most movement, calculated to bring public notice; to produce an of information among the both themselves and others the lectures at a nominal price. now ready to distribute the certain on the Rev. C. MACKENZIE, as he said, he saw around him many and, but one for regret, and this It was simply this, that the London on the 30th of September, a all their friends were out of town. dinner of the Sheriffs unfortunately ing; but for that circumstance, they the honour of the presidency of the London. It was indeed an occasion of the Crosby Hall Institution might from their friends; for the circumstances met were deeply interesting, and the occupied was very flattering. The which the Evening Classes had won at the of 1856 and 1857 was fully maintained in of the former occasions they had carried share of the prizes, and now again they highest place. This was the only institution of which more than three prizes or five first-class certificates had been assigned; and received six prizes and eleven first-class This was the only one that carried off certificates. And it was well worth noticing addition to £24 given to the young men, the and awarded, agreeably to the laws under which mination was conducted, the sum of £15 to the ; being £5 for each first prize, and £10 to Board, as having sent up the greatest number prizemen in proportion to the number of The latter sum would be set apart to meet needs of the "Evening Classes' Journal." After several remarks upon the benefit which accrued candidates and to society generally by these examinations, Mr. Mackenzie introduced the several one by one, detailing the degrees of distinction had obtained on this and former occasions the Chairman, with a few kind and earnest encouragement to each, handed them their

had not expected when he entered the room. The proud position which that institution occupied in the recent Society of Arts Examinations, was due partly to the superintendence of the committee and secretary, but principally to that spirit of inquiry which actuated all the classes. He sincerely congratulated the successful candidates, as the accidental organ of the council, on the success they had achieved, and earnestly entreated them to pursue, if possible, with increased ardour, the honourable path on which they had entered. Education was the work of a life if the motto "It is never too late to learn" was literally true. New discoveries in Art and Science were continually being made, and their rapidity and importance it was difficult to conceive or over estimate. We must not only keep ourselves *au courant* with them, but should assist in their development. He concluded the business of the meeting by thanking the audience for the indulgent attention they had lent to his efforts to discharge the duties which so unexpectedly devolved upon him.—This was duly seconded and carried unanimously. The formal notices of the next week's business were read, and the meeting separated.

NAILSWORTH (LITERARY AND MECHANICS' INSTITUTE).—The annual general meeting of this Institution was held on Tuesday evening, September 7th, at the Nailsworth Subscription Rooms. In the absence of the president, the chair was taken by Mr. E. Barnard, vice-president. The secretary, Mr. A. Leonard, read the report of the past year's proceedings, which speaks of a steady increase in the number of subscribers, a good attendance at the society's lectures and discussions, and an increased circulation of books, all of which show that the objects of the Institution are thoroughly understood and appreciated. The present number of members is 161, who are divided into thirty 20s., forty-two 10s., and eighty-nine 4s. subscribers, being an increase of 26 members upon the last year's subscribers. The financial prospect of the society is satisfactory. After defraying all the expenses of the year, a balance remains in the hands of the treasurer. The library has received a small addition during the past year, but the ample supply already at the disposal of the members, has met their requirements, and a fresh class of books can only be obtained by some special effort for that purpose, as the more general funds of the society are not sufficient to meet any unusual demand. The usual course of lectures has been well attended, those that have been gratuitously delivered being especially popular. The good attendance at the discussions has satisfied the committee that this branch of the society is still approved by the members. The committee finding that the formation of classes for mutual and other instruction is much needed, and having no rooms at their disposal in which such classes could meet; and having also long felt the need of a committee-room and ante-room for the accommodation of lecturers, &c., have proposed to fit up the unoccupied portion of the subscription-rooms as class and committee-rooms, and are obtaining subscriptions for this purpose. It is thought that these rooms would also be useful in accommodating a Sick Benefit Society and Penny Bank, and might also serve as a Museum of objects of local interest. From the financial statement it appears that the receipts have been about £98, and the disbursements about £95. The officers and committee for the ensuing year were then elected, and arrangements made for commencing the new session. After a vote of thanks to the chairman, the meeting separated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROVISIONAL ALLOWS.

[From Gazette, Oct. 8, 1868.]

- Dated 12th July, 1868.*
 1561. M. A. F. Mennons, 59, Rue de l'Échiquier, Paris—An apparatus for stopping leaks in ships. (A com.)
- Dated 21st September, 1868.*
 2117. T. Cook, Addiscombe, Surrey—Imp. in the method of papering and securing bankers and other closed cases against fraudulent erasure or removal.
 2119. L. De Parkeste, Paris—Imp. in apparatus to be applied to burners, with the object of increasing the lighting power of the gas flame. (A com.)
 2121. John Bethell, 8, Parliament street, Westminster—Imp. in treating pyrites.
 2123. J. Dewrance, Barge-yard, London—An imp. in the construction of pianoforte frames.
- Dated 22nd September, 1868.*
 2125. J. Johnson, Manchester—Imp. in machinery or apparatus in washing, churning, colour-mixing, or similar purposes.
 2127. J. Hope, Rhode Island, U.S.—An improved elastic plating roller.
 2129. T. Howe, Millwall, Poplar—Imp. in smith's forges.
 2131. J. Tyssen, Rotterdam, Holland—An improved apparatus indicating the speed of ships and other vessels.
 2133. L. Castelain, 53, Newman-street, Oxford-street—Converting all vegetable fibre, by aid of chemicals, into firm to make horsehair.
 2135. A. B. Childs, Gower-street, Middlesex—Imp. in steam machinery.
- Dated 23rd September, 1868.*
 2137. A. F. Jalourenau, Paris—Imp. in the manufacture of pipe.
 2139. T. O. Hinde, Dudley, Worcestershire—An imp. or imp. in the manufacture of iron and steel.
 2141. J. Wilson, 65, John-street, Sunderland—Imp. in Australia.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Oct. 8, 1868.]

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| <i>October 6th.</i> | 866. J. B. Smith. |
| 763. W. Ager. | 867. D. Moore. |
| 776. F. A. Leornu. | 907. R. Bodmer. |
| 782. W. Bowett. | 926. M. Sauter. |
| 783. A. Manbré. | 1070. W. B. Newton. |
| 787. S. Bickerton. | 1035. W. E. Newton. |
| 789. T. Kay. | 1122. J. Hesford. |
| 791. P. Rastel. | 1196. C. Clarke. |
| 796. T. de Jopling. | 1200. J. Rheinstadter. |
| 797. P. Schafer and F. Schafer. | 1292. C. Boeven. |
| 812. J. Knight. | 1324. T. Bailey. |
| 823. A. H. A. Durant. | 1754. W. Taylor. |
| 826. G. G. Brown. | 1866. M. A. F. Mennons. |
| 840. W. Carrow. | |

[From Gazette, Oct. 12, 1868.]

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| <i>October 12th.</i> | 879. A. F. Price. |
| 733. C. H. Chadburn. | 834. J. Greeny. |
| 802. G. Fye, R. Smith, and B. Crossdale. | 836. F. C. Gilbert. |
| 808. W. C. Holmes and W. Holbrook. | 837. D. Chalmers and J. I. Swallow. |
| 808. J. Gorham. | 839. J. B. Chirm. |
| 808. J. Gray. | 846. T. Luck. |
| 810. E. Groves. | 915. J. Braidwood. |
| 817. L. Cowell. | 1423. P. Griffiths. |
| 827. G. Walker. | 1879. J. A. Fawell. |

PATENTS ON WHICH THE STAMP DUTY OF 400 HAS BEEN PAID.

[From Gazette, Oct. 8, 1868.]

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| <i>October 6th.</i> | <i>October 6th.</i> |
| 2224. P. A. Halkett. | 2243. W. Rother. |

[From Gazette, Oct. 12, 1868.]

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| <i>October 1th.</i> | <i>October 1th.</i> |
| 2245. J. H. Johnson. | 2269. W. Cotton. |
| <i>October 8th.</i> | 2304. T. Venable, D. Lee and G. Howard. |
| 2267. J. Thornton, A. Thornton, W. Thornton, and H. Thornton. | |

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4120	Sept. 27.	The Eureka Booklet	James and Co.	Newhall-street, Birmingham.
4121	Oct. 7.	The Hercules Shirt, without gait		12, Eldon-street, Birmingham.
4122	" 9.	The Uniform Press		143, Tooley-street, Southwark.

Journal of the Society of Arts.

FRIDAY, OCTOBER 22, 1858.

EXAMINATIONS, 1859.

In reply to inquiries by correspondents, in reference to the Examination in French next year, the following works have been mentioned by the Examiner in that subject, as likely to be useful to candidates in studying the history of France:—

Duruy's *Histoire de France*. 2 vols, 6s. 6d.

Soulain de Bossay's *Histoire de France*. 1 vol., 1s.

The following editions of works which may be taken up by candidates are given, as being moderate in price and easily procured:—

Voltaire: *Louis XIV.* (Firmin Didot). 2s. 6d.

Montesquieu: *Grandeur et Décadence des Romains.* (Ditto). 2s. 6d.

Les Œuvres de Corneille. 2 vols., 5s.

Tocqueville: *L'Ancien Régime et la Revolution.* 6s. 6d.

These may be obtained of Messrs. Williams and Norgate, Henrietta-street, Covent-garden.

BRITISH ASSOCIATION, LEEDS, 1858.

THE PATENT LAWS.

Report of the Committee of the British Association, presented to the Mechanical Section by W. Fairbairn, F.R.S., President:—

The subject of the patent laws has frequently occupied the attention of meetings of the British Association, and committees have been, from time to time, appointed for the purpose of considering how those laws might be rendered more efficient for the objects with which they are maintained. Your Vice-President, the Rev. Vernon Harcourt, in the inaugural address at the first meeting of the Association, held at York, September, 1851, in which he expounded the objects and plan of the Association, referred to those laws as an instance in which fiscal regulations interfered with the progress of practical science, and as failing to give protection to property in scientific invention, to the same extent as protection is given to every other species of property, and suggested a revision of those laws as one of the subjects to which a scientific association might be justly expected to call public attention, and your Vice-President, Mr. David Brewster, and others, have, on several occasions, brought the subject before meetings of the Association.

By the Patent Law Amendment Act, passed in the session of 1852, the rights of the inventor to property in the offspring of his brain, and in the creations of his intellect, when embodied in products of national industry, were fully recognised; provisional protection to that property was secured to such inventor, from the date of a application for a patent: one proceeding was substituted, and one patent issued, extending to the whole of the United Kingdom, instead of three proceedings and three patents, separate and distinct, for each of the three countries, England, Scotland, and Ireland; property was protected, and protection obtained for six months by a payment of £5, for three years by a payment of £25, and for the further terms of four and seven years by addi-

tional payments of £50 and £100 respectively, instead of by the payment of upwards of £300 in the first instance, under circumstances of such uncertainty as threw discredit on the whole system; the specifications of all patents are to be printed and published, and sold at extremely low prices, a benefit to the public as well as the inventor which it would be difficult to estimate too highly; and, lastly, provision was made for the regulation of matters relating to patents, by Commissioners furnished with ample powers for the purpose.

This Act came into operation on the 1st of October, 1852, and the experience of the first two years showed that the payments by inventors, upon the above scale of charges, would be at the rate of more than £50,000 per annum, without including the further or additional payments for the maintenance of the patents for the further terms of four or seven years, after the expiration of the first three or seven years respectively. At the meeting of the British Association in Liverpool, September, 1854, a committee, presided over by the Earl of Harrowby, was appointed "for the purpose of taking such steps as may be necessary to render the patent system, and the funds derived from inventors, more efficient and available for the reward of meritorious inventors, and the advancement of practical science." This committee communicated with Earl Granville and Lord Brougham, to whose exertions and watchful care the passage of the measure of 1852 was attributable, and made a report to the meeting of the British Association held in Glasgow in the following year, when the subject of the tax on inventors, and the appropriation of the funds so levied, was fully discussed; and another committee, consisting of his Grace the Duke of Argyll, the Earl of Harrowby, Colonel Sabine, the Master of the Mint (Professor Graham), Mr. Fairbairn, and Mr. Webster, were appointed with similar powers. The Glasgow Committee addressed a memorial to the Lord Chancellor (Lord Cranworth), calling attention to the proceedings which had taken place at the various meetings of the British Association; to the numerous questions of administration and legislation then adverted to, or which might be expected to arise; and suggesting that her Majesty should be advised, in accordance with the provisions of the Patent Law Amendment Act, 1852, to appoint others than the official Commissioners, and to make the working of that Act the subject of immediate inquiry.

At the meeting of the British Association held at Cheltenham in 1856, a committee, consisting of the Earl of Harrowby, Lord Stanley, M.P., Mr. Fairbairn, Professor Graham (the Master of the Mint), Mr. James Heywood, Mr. Commissioner Hill, Gen. Sabine, and Mr. Webster, were appointed with like powers. The Earl of Harrowby and Mr. James Heywood communicated personally with the Lord Chancellor; Lord Stanley took a warm interest in the subject, embodying his views on the necessary alterations in a published pamphlet, but up to this time the objects in view have not been attained, and it will be for this meeting of the British Association to consider what further steps should be taken.

The printing and publication of the specifications has led to results which were hardly anticipated, as to which the following extract, from a report of the Commissioners of Patents in 1856, will be read with interest:—

"The Commissioners of Patents have presented complete copies of all their publications to such of the Government offices and seats of learning as have applied for them, and to the principal towns in the United Kingdom, on condition of their being daily open to the inspection of the public free of charge. In their selection of towns for this gift, they have been guided by the number of applications for patents proceeding from each.

"This gift has in most cases laid the foundation of public free libraries where none previously existed. In some instances, where the local authorities hesitated to accept the works on account of the incidental expenses, the custody has been solicited and temporarily under-

or the growth of wheat; whilst fallow (an important effect of which was the accumulation within the soil of the available nitrogen of two years into one) and adding nitrogenous manures, had each much the same effect in increasing the produce of the cereal crops.

Other experimental results were adduced, which illustrated the fact that 4 years of wheat alternated with fallow had given as much nitrogen in the 8 years as 8 crops of wheat grown consecutively. Again, 4 crops of wheat, grown in alternation with beans, had given nearly the same amount of nitrogen per acre as the 4 crops grown in alternation with fallow, consequently, also, much about the same as the 8 crops of wheat grown consecutively. In the case of the alternation with beans, therefore, the whole of the nitrogen obtained in the beans themselves was over and above that which was obtained during the same series of years in wheat alone, whether it was grown consecutively or in alternation with fallow.

Interesting questions arose, therefore, as to the varying sources or powers of accumulation of nitrogen in the case of crops so characteristically differing from one another as those above referred to.

It had been found that the leguminous crops, which yielded in their produce such a comparatively large amount of nitrogen over a given area of land, were not specially benefited by the direct application of the more purely nitrogenous manures. The cereal crops, on the other hand, whose acreage yield of nitrogen under equal circumstances was comparatively so small, were very much increased by the use of direct nitrogenous manures. But it was found that, over a series of years, only about four-tenths of the nitrogen annually supplied in manure for wheat or barley (in the form of ammonia-salts or nitrates), were recovered in the immediate increase of crop. Was any considerable proportion of the unrecovered amount drained away and lost? Was the supplied nitrogenous compound transformed in the soil, and nitrogen in some form evaporated? Did a portion remain in some fixed and unavailable state of combination in the soil? Was ammonia or free nitrogen given off during the growth of the plant? Or, how far was there an unfavourable distribution and state of combination within the soil of the nitrogenous matters applied directly for the cereal crops—those, such as the leguminous crops, which assimilated so much more, gathering with greater facility, and from a different area of soil, and leaving a sufficient available nitrogenous residue within the range of collection of a succeeding cereal crop? These questions, among others which their solution more or less involved, required further elucidation before some of the most prominent of agricultural facts could be satisfactorily explained.

Comparing the amount of nitrogen yielded in the different crops when grown without nitrogenous manure, as above referred to, with the amount falling in the measured aqueous deposits, as ammonia and nitric acid, it appeared, taking the average results of the analysis of three years' rain, that all the crops yielded considerably more, and some very much more, than so came down to the soil. The same was the case when several of the crops had been grown in an ordinary rotation with one another, but without manure, through two or three successive courses. Was this observed excess in the yield over the yet measured sources at all materially due merely to exhaustion of previously accumulated nitrogenous compound within the soil? Was it probably attributable chiefly to the absorption of ammonia or nitric acid from the air by the plant itself or by the soil? Was there any notable formation of ammonia or nitric acid from the free nitrogen of the atmosphere? Or did plants generally, or some in particular, assimilate this free nitrogen?

As already intimated, some of the points which had been alluded to were, at the present time, under investigation, the authors having in this the able assistance of Mr. Smith. Others, it might be hoped, would receive elucidation in the course of time. There of course still

remained the wider questions of the original source, and of the distribution and circulation of combined nitrogen in the soil, in animal and vegetable life on the earth's surface, and in the atmosphere above it?

PATENT MUSEUM, SOUTH KENSINGTON.

The following is the number of visitors for the week ending 16th October, 1858:—Morning, 695; Evening, 769. Total, 1,464. Total number of visitors to the Patent Museum and Library since the period of free daily admission,—81,814.

Colonial Correspondence.

LABOUR IN THE WEST INDIES.

SIR.—That *vexata questio*, labour in our West India colonies, appears to be still as far from a satisfactory settlement as when, twenty years ago, it began to stir up the angry feelings of the growers of sugar and the manufacturers of rum. To the abolition of slavery and the adoption of free trade, the depressed condition of those colonies has been ascribed. Those events, when they first occurred, did, no doubt, occasion a violent shock to them. The annihilation of slavery and protection did unquestionably, for a time, exercise upon them a precipitating influence. But the effect may be compared to one of their own hurricanes. Houses are blown down, trees are prostrated, roads are torn up, and the roaring tide, lashed into fury by the wind, marches like a conqueror over the land, laying waste "trim gardens," and sweeping away temples, and obelisks, fountains, and grottoes; but when the gale subsides, the heavens are serene and bright, and the air, cleared of noxious vapours and the floating seeds of disease, is sweet and fresh; the wild rabbit again peeps from her hole, the birds venture from their leafy hiding-places, and again sing their matin songs and chant their vesper lays, and all nature, awakened as it were from a disturbed dream, is placid and at rest. Such was the convulsion produced at first by emancipation and free trade. The effects were natural, and to be expected. The colonies were struck to the earth; but, like Anteus, they ought to have arisen with renewed strength. If they did not do so it was their own fault. Protection has gone, but with it has gone an abnormal condition of trade, in which the prices of commodities were regulated by restrictive laws, instead of being governed by the natural rise and fall of the markets. Slavery has gone, but with it have gone much cruelty, much depravity, and a system of labour in which the only tie between the master and his servant was the chain, the only incentive to work was the cat. But instead of protection, we have trade freed from restraints, and, like an infant Hercules liberated from ligatures and bandages, beginning to exhibit its extraordinary powers. In place of slavery we have free labour;—the work of willing hands and cheerful hearts, instead of the constrained toil of reluctant limbs and broken spirits.

As early as the year 1514, the repugnance of slavery to natural rights, was acknowledged and pronounced by no less a person than Henry VIII. That monarch emancipated two of his slaves with their families, and the deed of manumission commences as follows:—

"God at first created all men equally free by nature, but many have been reduced to slavery by the laws of men. We believe it, therefore, to be a pious act, and meritorious in the sight of God, to set certain of our slaves at liberty from their bondage, &c."

It is not easy to account for such language, coming from a man who has been justly described as—

"The monster king of all that age,
Fierce in his lust, but sorer in his rage."

The words "natural rights" sound ridiculous when proceeding from the mouth of the ruthless tyrant who slaughtered Surrey, murdered Moore, and divorced himself a *vinculo* from his wives by a *bill* sharp and sudden, and much more effective than the parliamentary one which has recently come into operation for dissolving the marriage tie.

That free labour was much better than slave labour, that it was more economical and more productive, that it was more satisfactory in every sense, both to the master and to the servant, was discovered in the 14th century. Henry says: "Various causes contributed to the decline of villenage in England. The proprietors of land by degrees discovered that slaves, who laboured not for themselves, but for their masters, were often indolent or refractory, and that they got their work performed better, and even at less expense, by hired servants."

What was true in the fourteenth century is true in the nineteenth. What was true in England is true in Jamaica, in the United States, and in Cuba. But, in the two latter countries, they cannot or will not perceive it. Nay, even in our own colonies, there are many who look back to the days of slavery with regret—as the Israelites in the desert lamented the time when they were in the land of Egypt, when they sat by the flesh-pots, and when they did eat bread to the full, as they languished in the arid and pathless wild, for the savoury menses and the barley-wine on which they feasted in the days of their bondage. Many there are who look enviously at Cuba, and wish that they also could have slaves to cultivate their sugar plantations and their coffee mountains. Many there are who, if they dared, would call loudly for a return to the vicious system of "Involuntary servitude." Of course all would repel with indignation such a horrid imputation. Nevertheless, there are individuals who indulge in such an iniquitous wish, but it is concealed in the darkest recesses of their hearts—in some mental "chamber of horrors," the contents of which will never be known to the world, unless during a fit of drunkenness or insanity the owner should involuntarily leave the door open—as Falkland locked up the bloody dagger, the evidence of his guilt, in his impenetrable iron chest. It is fortunate that in their case there is no prying Caleb Williams, to drag to light the "shape unholy." Although it is quite impossible to sympathise with those who indulge in such wicked longings, so far as those longings are concerned, it is also, at the same time, impossible to deny that they have abundant cause for discontent. When they see the verdant slopes and rich valleys of Cuba, covered with the bright green blade of the sugar-cane, or the beautiful white blossom of the coffee-tree; when they see the lofty Moro castle, and the battery of La Punta, which protect the capacious harbour of Havana, crowded with stately vessels from all parts of the world—from Glasgow, Liverpool, and London, from New York, Boston, and New Orleans, from St. Petersburg, Havre, and Hamburg; when they see the streets of that opulent and magnificent city thronged with busy and anxious passengers, hastening to keep appointments for the sale or purchase of valuable cargoes of sugar, coffee, or tobacco; when they see the long *passeeos*, with their palaces, statues, and hedges of rose-trees, crowded with volantes mounted with solid silver, and drawn by large black Spanish mules, decorated with the most costly trappings, rolling rapidly along; when they see the Plaza de Armas brilliantly lighted with gas, where a large assemblage of richly-attired and beautiful ladies, wearing a light gauze mantilla, which is thrown over their dark glossy hair, and which floats behind them like a thin silvery cloud, promenaded with their husbands, brothers, and caballeros, and listen to the splendid military band which is playing the newest polkas and waltzes before the Captain-General's palace, a large Italian plasterer having Corinthian columns which exhibit a scene within

gold and silver plate, silks, and jewels; when they observe all these indications of wealth and prosperity, and they turn to to their own melancholy inland, and behold brown, parched plains, or tangled wildernesses of bush and briar, the abodes of the agoutis and the lizard, where, instead of the lowing of oxen, the creaking of wheels and the whetting of scythes, they hear the chirp of the squirrel and the coo of the wood-pigeon; when they see a town, once rich and flourishing, now looking like a city which has been beleaguered, sacked, and pillaged; instead of noble Grecian structures, having porticoes of Doric or Ionic columns, with lions beautifully executed in the whitest marble frowning at the entrance, they see rotten wooden buildings, leaning on one side like the tower at Pisa, with every gust of wind a shingle flying from the roof, with every shower of rain a torrent rushing through the doors; instead of the gay volantes lustreous with burnished silver, and paint, and varnish, and driven by a smart servant, having on a red or blue jacket covered with gold lace, and polished jack-boots rivaling his skin in brilliancy and blackness, they see a wretched vehicle, which looks like the skeleton of a young omnibus—like a starved stage-coach not arrived at its majority, the lining greasy, torn, and moth-eaten, the paint almost entirely scrubbed off, broken springs mended with old rope, and pulled through the sand fetlock deep, sometimes by two horses, which appear to have been the subjects of the experimental philosopher, and to have arrived at an oat a-day, flavoured perhaps with a single blade of grass, sometimes by a tall horse and little pony, and sometimes by a mule and a donkey, and urged on by every persuasion of voice and whip which the black, grinning, shoeless, hatless, coatless, saucy driver can have recourse to; instead of the granite paved streets and macadamised *passeeos*, abominable ways in which there is every kind of nuisance and dangerous obstruction, here a heap of old bricks, and tiles, and broken bottles, there a dunghill, here a huge fissure, and there a deep pit attempted to be filled up with straw and manure, abounding with dangers as great as the Maelstrom, Scylla and Charybdis, and those dreaded rocks of Epirus, called by Horace—

"Infames scopulos Acroceraunia;"

when the colonists behold this contrast, they may be excused for complaining, and although their complaints are not always just and reasonable, still they may be pardoned.

The question however, is, what is to be done? It cannot be supposed that the British Government or the British people are indifferent to their distress, although they may not think, that for the purpose of relieving them, a decree should go out that all the world should be taxed. It seems that "labour" is the cry. Give us say they, an unrestricted permission to engage the negroes on the coast of Africa, until we shall be able to compete with the slave-cultivated colonies. But permission to hire free negroes on the coast of Africa need will be accorded them; it is useless therefore to go on crying for what they cannot have, like little Pickle in the "Spoiled Child," who howled because he was not permitted to sit a-stride of the roasted saddle of mutton: "like the dear, sweet child, who set up his shrill pipe and deafened the whole neighbourhood, because he couldn't have the moon to play with—little innocent!"

In my opinion, the danger of all unlimited engagement of free negro labour in Africa, has been greatly exaggerated by the fears of those philanthropic men by whose noble efforts the "damned spot" of slavery was obliterated throughout the whole length and breadth of the British Empire. A license to engage free negroes for our colonies, would, no doubt, be liable to be abused, but securities might be devised which would have the effect of preventing any illicit traffic from being carried on. A license, subject to certain restrictions, to hire African labourers, would, I conceive, be more likely to

check the slave trade, and ultimately to extinguish that abominable traffic altogether, than the means which are at present adopted. To suppose that we can prevent slaves from being landed in Cuba by sending our ships of war to cruise along the coast of that island, is simply absurd. A "cruiser's digest" would show how fruitless has been the scheme. Cuba has at least 2,000 miles of coast, and the combined fleets of England and France would not be able effectually to blockade it. A thousand "Leviathans" could not do it. General Cass, in a letter to Lord Napier, says, "the joint blockade of the coast of Africa has been pursued some years, and the benefit it has produced bears no reasonable proportion, he regrets to observe, to the expenditure of life and treasure it has cost." This is no doubt quite true, but the writer adds, "but there is another way, without the danger and difficulties and inefficiency, and that is to shut the ports of Cuba. But supposing we could be justified in having recourse to such a proceeding (amounting in fact to a declaration of war) towards a nation with which we are at peace, how would it prevent the landing of slaves? Does the captain of a smuggler ever attempt to come into a port until he has discharged his cargo? Would our friend Nanty Ewart of the "Jumping Jenny" have done such a thing? No; he would not have been guilty of such an act of stupidity; he knew his business too well. A smuggler who knows his trade, and who is cool and cautious, and not like that pig-headed ruffian Dirk Hatteraick, will stand off and on until he has the signal which informs him that "All's right," when he will run his craft into a snug, secluded little bay, and, at the dead of night, when all is prepared—when the light covered carts, with wheels wrapped round with straw and other ingenious contrivances, are in readiness—will land his cargo in safety. Robin Hood's Bay, near Scarborough, and Skinnengrave, a small village on the sea coast, near Skelton Castle, once the seat of the De Bruces, were, 30 years ago, the scenes of many a romantic smuggling adventure.

Mr. Cass seems to think that a slaver goes boldly into the harbour of Havana, in St. Lago de Cuba. No such thing. She dodges about during the day, and steals quietly under the cloud of night into one of those numerous bights which abound on the coast of Cuba, where there is not a single human habitation, and where the slaves may be landed without the slightest chance of detection. The instant the poor creatures have placed their feet upon the shore, they are whisked away in every direction, with as much celerity as the dishes which were swept from the longing eyes of the hungry Sancho, when that practical philosopher was giving proof that a man may make a good governor without having been brought up to the craft, and that no special qualifications, beyond sound common sense and shrewd mother wit, were requisite for the office. Some years ago, whilst sailing into the Havana, the pilot drew our attention to a small, black, wicked-looking schooner, clipper-built, and having her masts well raked, which was lying at anchor about fifty yards from the Moro Castle. He informed us that she had landed 600 slaves at a little bight about ten miles off, and early that morning she had come into the harbour with all the appearance of an honest mercantile vessel, having all the necessary papers strictly correct. I do not recollect under what flag she sailed. An English and an American war-steamer had been cruising about at the time, and these vessels were now lying close together, appearing to be on the most amicable terms.

Mr. Mason, the American Minister to France, in a letter to the President, says, "he feels confident that in future the denunciation of American slavery will be greatly moderated, if not silenced in France, perhaps in England." He adds, "that it is quite evident that the conviction is gaining strength, both in England and France, that the compulsory emancipation of the slaves in their tropical colonies, by authority of their governments, was a grave political error."

In England, those who are able to think calmly, dispassionately, and rationally upon the subject of American slavery, are of opinion that it ought to be abolished as soon as possible, but that to give so great a number of slaves as exist in the Southern States of the Union, the greater portion of whom are without any mental culture, immediate emancipation, would be a dangerous experiment. But there is not in England a single individual deserving of respect, who regrets in the slightest degree the sudden and complete emancipation of the slaves in our own colonies. The people of England—who, with all their faults, and they have many, have a strong natural hatred of oppression in every form—do not think that it was a grave political error. They rejoice that it was done, although it was an expensive operation; although great violence was done to that vestriary department which an Englishman guards as vigilantly as did the dragons the golden apples of the Hesperides—*videlicet*, his breeches pocket. They do not grudge one farthing of the money which accomplished so glorious an object. Nay, it is my firm belief, that, careful, cautious, and unenthusiastic as they are, and, in some cases, frugal to a fault, they would, in the interests of humanity, gladly pay the same amount again to put an end to slavery in every part of the world. The very name of slavery is odious to every Englishman. It grates upon his ear. If it were in his power he would annihilate the thing, and abolish the word. Not a dictionary should contain it, and it should be an offence punishable by fine and imprisonment to utter it. But the slaveholders of the States will say to him, "Why do you kick up such a shindy about our niggers, when you have no end of slaves in your own country? Look at that little factory boy with his precocious pensiveness and his premature sadness. He is scarcely 10 years old, and yet he has the thoughtful expression of a man of 30, and already—like Peter Bell—his 'forehead wrinkled is, and furred by thinking of his *whens* and *hows*.' Look at the father of that poor child of want and misery. He is 35 years of age; but, judging from his appearance, you would say that he was 60. His hair is white, his countenance cadaverous, his shoulders round, his back bent, and his legs crooked. Look at that young girl, with her delicately chiselled features, her large expressive blue eyes, and her faultless form. If her parents had been wealthy; if they had been amongst the aristocracy of the land, hundreds would have knelt at her feet, and done fealty to her charms. But they belong not to that caste, and she is only a poor seamstress, with a widowed, bedridden mother and two young sisters to support. Alas! they will not have her support long, for her cheek is pale and thin, and hollow; her eye has an unnatural burning lustre, and ever and anon she coughs a short dry cough, and as she does so, she puts her long transparent hand upon her side. Why does she do so? Ah! postpone your inquiry for three months, then make it, and read the answer engraved upon a small piece of freestone standing in the ground amongst a number of little grassy hillocks—the unpretending tumuli of the poor. Well, are not these, and hundreds more whom I could mention, slaves—aye, as much slaves as our negroes. The only difference is, *our* slaves have comfortable homes and plenty to eat and drink, *your* slaves die of hunger, cold, and wretchedness."

Americans may talk, and have talked in this strain. But the cases are not parallel. It is true that we have much, too much, wretchedness and want,—it is true that there are heartless masters and mistresses who grind those whom they employ down to the earth. But the poor creatures who are thus treated still are *FREE*. They may leave their task-masters and task-mistresses whenever they like, and they are paid for their labour, although that pay is sometimes, indeed, very, very small. Though born to an unhappy lot, they are *not* slaves. They cannot be bought and sold; they cannot be made the victims of an employer's brutal passions; they cannot have the brands of ownership burnt

into their flesh; they cannot have their ears cut off or their eyes gouged; they cannot be separated from their offspring; the greatest and wealthiest in the land cannot wrong them with impunity. Above all, they cannot be prevented from reading their Bible, that well-spring of hope, that everlasting fountain of comfort and consolation.

To return to African free labour. I have said that the danger of permitting free negroes to be engaged on the coast of Africa has been greatly magnified. But the opinion and feeling of a large and respectable class are too strong against that permission. We may take it, then, as a thing settled and decided, that the British Government never will, at least not for many years, give their sanction to it. But let us seriously inquire what we lose by the prohibition. We must have labour for our colonies; that is granted. But does it follow that that labour must be African labour? The colonists have been so long accustomed to negro labour, that they think sugar would not be sweet, nor rum well flavoured, without it. When the representatives of all the trades met in solemn conclave to consider what were the best materials with which to fortify their town, which was threatened with a siege, the tanner exclaimed, with honest enthusiasm, and a confiding faith in hides,—"There's nothing like leather." So the West India planter, when you talk to him about labour, ejaculates, with equal fervour, "There's nothing like niggers." The owner of a West India sugar estate, who was a great lover of cheroots and "old Jamaica," and to whom his agent used annually to send a puncheon of the spirit of cane (no pun intended), observed that the rum of a particular year was far superior to that of former or subsequent years, and he wrote to his attorney, "Pray tell me the reason why." The reply was, "You can't reasonably expect to have a nigger drowned in every puncheon." But it may be doubted whether the dead body of a negro would impart so delicious a flavour to the rum, except to a vitiated palate, (as George I. is said to have delighted in the oysters which he ate in Hanover, which stank, and to have regarded the fresh oysters which he got in England as insipid,) seeing that when alive it is by no means as fragrant as the rose; and it may be equally doubted whether the labour of the negro is preferable to that of others. Negro labour was first introduced into the New World in the reign of the Emperor Charles V., on the suggestion of Bartholemi delas Casas, Bishop of Chiapa. This was done from feelings of humanity—not to the negro certainly, for he was scarcely considered to belong to the family of man—but to the aboriginal Indians, who were most cruelly treated by the Spaniards. Since that time Africa has been the grand nursery for slaves, the great fountain of labour. It is much to be lamented that the discoverers and conquerors of the New World belonged to a race and a profession to whom the labour of the spade and the hoe was a degradation. Reared in the camp during the fierce conflicts which were constantly occurring between Arragon and Castile, and between those kingdoms and the Moors,—trained to arms, and habituated to plunder and all the excesses which the tented field in those days fostered and encouraged, they were daring and profligate, hardy and licentious. To them, as to ancient Pistol, "the world was their oyster, which they with sword did open." When the New World spread out its riches before them—like Pomona pouring from her lap the fruits of the earth—they buckled on their armour of proof, girded on their good swords, grasped their trembling lances, and crossed the seas in the fraillest of barks, to conquer and to gather them. The idea of labour never entered into their thoughts. Had it been differently ordered—had those regions fallen into the possession of a peaceful and industrious people—a black skin would never have been seen in the colonies, slavery would never have been established, and European labourers would have turned into a garden that which is now a desert.

The colonists, then, have become habituated to the labour of Africans, and they think that it is impossible to do without it. I believe that they are very greatly in error. It has been the fashion to represent the negro as a suffering, patient, docile, simple, faithful creature. People are apt to imagine that every negro slave is an Uncle Tom, and that every owner of such slave is a Legree. But Uncle Toms are very scarce, and Legrees, unfortunately, are too plentiful in every rank and department of life. We find them amongst the nobility, amongst generals, amongst governors of colonies, amongst Judges. The noble lord who shot his gamekeeper, and was hanged for it, was a Legree. The gallant General who ordered women to be flogged was a Legree. Mr. Brownrigg was a Legree. The Judge who condemned the Lady Lisle to be burnt was a Legree. Almost every human being has, I am afraid, got something Legreeish lurking somewhere about him. But Uncle Tom is a rare bird—he is a *niger cygnus*—he is a black cloud with a silver lining,—he is a kind of allegorical personage, representing negro virtue in the abstract, as Minerva represented wisdom, Mars war, and Venus beauty. Uncle Tom is an idea, grand, majestic, imposing. He is like the visionary republic of Plato, the new Atlantis of Bacon, the Utopia of Moore, or the Laputa of Swift. All praise to Mrs. Beecher Stowe for her philanthropic efforts. May she live a thousand years, and, as the Persians say, may her shadow never be less. But I don't agree with her. I have not an excellent opinion of the African. The good qualities which have been attributed to him—simplicity, endurance, patience, fidelity, honesty—are mythical. The negro is unimprovable. What he was a thousand years ago he is now, and what he is now he will be a thousand years hence, if the world should last so long. Send missionaries to him—teach him to read, teach him to pray. Show him the way of salvation, and place him in the right path to everlasting life. But don't bring him from his own country; leave him with his palmettoes, his calabashes, and his mangrove, his panthers, his baboons, and his lions, his flamingoes, and parrots, his gold dust and his ivory. Where, then, are the West Indian colonists to obtain labour, if not from Africa? From India. That country is the great and true source of labour. The experiment was tried to a limited extent, and it was eminently successful. "What! employ Indians," says a choleric old gentleman, with a florid complexion, "why they'll cut all our noses off, sir!" "What! employ those horrid Indians?" exclaims a fair vestal of threescore, "Why, Lord have mercy upon us, we shall all be ravished." Now, unquestionably, whatever any eccentric gentleman may say to the contrary, the most frightful outrages were committed by the Sepoys during the late mutiny in India. But to argue from those atrocities, that the disposition of the Hindoo is by nature cruel and sanguinary, would be to commit a grievous error. During periods of extraordinary excitement, men are guilty of excesses which cannot justly be said to be the results of their natural character. During the revolution in France when men drank of the eup of liberty for the first time, and quaffed the bowl to the very dregs, the intoxicating draught had the same effect upon them as the maddening firewater had upon the American Indian, and they perpetrated deeds at which humanity shuddered. But it would be very unfair to infer from the crimes which were then committed, that the French people are naturally a cruel race. Had there been no revolution. Robespierre, Marat, Danton, might have lived and died with the character of human and virtuous men, and, in their course through life, might have left behind them a trail of light, instead of a wake red with blood. But the revolution awakened the evil passions of their nature, and they became murderers and cut-throats. "Is thy servant a dog, to do these things," said Hazeel, yet he did them. No! The Hindoo is not, as human nature goes, a bad man. He is not more so-

guinary than the rest of his sanguinary species. He is also improvable. He possesses the Asiatic intellect—that intellect which founded the most powerful monarchies, erected the most stupendous structures, achieved the most wonderful conquests of the physical obstacles of nature, and has left remains containing a hidden and mysterious meaning, which will for ever elude the grasp of modern science. We cannot do better than import from our vast Indian empire Hindoos to cultivate and people our West Indian colonies. We have the testimony of Lord Harris and Sir Henry Barkly, to prove that the Indian coolies, in Trinidad and British Guiana, made admirable labourers, and that they were extremely quiet and well-conducted. In Jamaica, it is true, the experiment was not successful. But, somehow or other, nothing does succeed there. There were, however, particular causes in that island which were adverse to the experiment. The law regulating the importation of coolies was bad; the treatment of them by many of the planters was bad; and the coolies themselves, not being from the rural districts, but being lazy, loitering vagabonds from the towns—something like the lazzaroni of Naples—were bad.

But the system on which all the coolies were engaged was vicious. The practice of procuring labour, as it were, from hand to mouth, is most objectionable. When that is pursued, the labourers, as soon as they have earned a little money, will leave the colony, and return to their own country to spend it. That was the case with the better class of coolie labourers in British Guiana and Trinidad. They hoarded their wages, and when they had accumulated a pretty good sum, they returned with it to India. But no colony can be permanently populous which depends upon such precarious supplies of labour. It may flourish by fits and starts, but not steadily and continuously. It may be compared to a wild March day, on which amidst gusts and showers a ray of sickly sunshine is occasionally seen. The farmer would sow his wheat to little purpose, if he could not command labour when it was the time to reap it. The sugar grower pursues an uncertain calling, when, although this year his gains may be large, the next year may bring him a total loss. Every colony ought to have a settled labouring population within itself, and this can never be accomplished by the system which has been hitherto pursued. Men are brought from a great distance at considerable expense, professedly for a limited term, and at tempting wages, from their wives and children. They do not emigrate. They do not bring with them their Lares and Penates. Bramah, Vishnu, and Siva are left in their accustomed niches. Their wives are embraced, their children are kissed, and they set sail for the western El Dorado, promising to return as soon as possible with its treasures,—and they do return. Now, this system of supplying the colonies with labour, in my opinion, is faulty, and will never succeed. I will state my own plan. Let the country from which you obtain labourers be India. Avoid Africa. Avoid China. Do not engage a single labourer from the towns. Let all be brought from the rural districts, and let them consist only of those who have been accustomed to cultivate the soil. Let them be taken, in fact, from the Indian peasantry. Bring with them their wives and children, and for every two men let there be brought three women, in order to supply deficiencies occasioned by death. When you have got them into the colonies, allot to each labourer, for his occupation only whilst he continues a labourer, a small plot of ground, and let him have one day in the week to cultivate it. Do no violence to his religious prejudices. Let him perform his superstitious worship, and celebrate his Pagan rites as much as he will, so long as he is not guilty of immorality, indecency, and inhumanity. Let him be brought over to a purer faith by reason and conviction. Omit no proper opportunity of inculcating the doctrines of Christianity. Teach him to read and write, to reflect and reason. By adopting these means, you would very soon get a labouring

population much more valuable than the slaves of Cuba, or of the United States. With such a population, there is no sugar-growing country in existence which could compete with our West India colonies in that article—and not only in that article, but in cotton, rice, and a great number of other products. You would have a permanent labouring population attached to the soil, which would rapidly increase, and from which would arise in time an intelligent and respectable class, qualified to discharge the duties of many municipal offices, which class would go on improving, until from it might be selected men eminently fitted for the highest appointments in the colonies.

The star, then, of colonial prosperity is in the east. It is from that quarter, and from that alone, that we may expect to obtain the means of awakening our West India colonists from their present cataleptic condition. With thousands and tens of thousands of free and voluntary immigrants—men, women, and children—from India, immigrants who come, not like locusts, to devour every green thing, and then wing back their flight; who come, not as the swallow comes, for a season, to revel in the summer sunshine, and skim along the surface of the calm, translucent lake—immigrants who bring out with them laziness, stupidity, brutality; but immigrants, active, industrious, intelligent, and possessing an intellect capable of the greatest possible cultivation. I say, with tens of thousands of such immigrants settling down in our West India colonies, making there their homes, establishing there their “pledges to fortune,” erecting there their altars, and setting up there their household gods, what might we not expect? The Spaniards, like the old Romans, accomplished great works wherever they settled,—they built magnificent cities, they erected splendid cathedrals, they constructed impregnable castles. Mexico, Havana, and Lima are their handiwork. But were Jamaica, Trinidad, and British Guiana, peopled with Asiatics, cities would soon arise in the vast untenanted wilds of those colonies, equal to any which exist in Mexico or Peru. All architecture came from the East; from the East came the art of cultivation; thence also came the principles of commerce. Men personified these arts, they deified them, and they worshipped them under the allegorical appellations of Osiris, Mercury, and Apollo. Again let us turn our eyes to the East, for from that quarter alone help can come.

I am, &c.,

R. TEMPLE.

Belize, British Honduras, September 17, 1868.

Home Correspondence.

EDUCATION BY MECHANICS' INSTITUTES.

SIR,—The importance of extending education amongst the working classes of this country by the agency of Mechanics' Institutes has not yet been sufficiently recognised, nor its means of usefulness applied with that regard to practical utility which can alone afford the hope of permanent success. It is a favourite theme at meetings on the subject of popular education, to lament that, notwithstanding the number of schools and teachers provided from various sources, there are so many who derive little or no advantage from them, owing, in some cases, to indifference, but in the majority of instances to the many means of employment at an early age. All this is too true, but many of the remedies proposed are impracticable, and, in the absence of any more attainable remedy, it would be well to direct more attention than has hitherto been done to the capabilities of Mechanics' Institutes to supply some part at least of the admitted defect.

It is not unusual at the festive gatherings of these Institutes, for public speakers to dilate on the importance of class instruction, but, although in the majority of instances such a mode of imparting information is put for-

ward as a distinguishing feature, I believe it will be found that in very few is there that systematic management which is of the first consequence to ensure efficiency. Gentlemen are elected as members of the committee who have neither the qualifications nor even the intention to fulfil the duties which properly belong to the office. Their absence, even at periodical meetings, is more often the rule than the exception. They know very little of the condition or working of the Institute, except from the report presented at the annual meeting, and then, when they hear of a decrease in the number of members, and a balance due to the treasurer, they are surprised that the public feel so little interest in their ill-performed labours.

Much of this might be prevented if the Committee were chosen of men who were able and willing to perform the duties which they undertake, and would bear in mind that a secretary, however active and intelligent, is not a substitute for their neglect. Classes may be formed and teachers appointed, but with the best intentions they will become failures if they receive none of that regular supervision which is necessary for the efficient working of any system however ingeniously devised. Perhaps one of the first elements of success in class instruction is the punctual attendance of both teachers and pupils, and this should be, as far as possible, secured by the employment of paid teachers, with such gratuitous assistance as the Institute may be able to supply. But, whatever course be pursued in this respect, the irregularity of the teacher will soon produce similar conduct in the pupils, and the failure of the class will be inevitable.

An essential condition of class instruction is punctuality, and this should be insisted upon to as full an extent as is ordinarily pursued in good schools. Arrangements should then be made for a periodical visitation of the several classes, either by a sub-committee specially appointed, or by two or more members in rotation, as may be deemed most convenient. In elementary classes, the pupils should be examined at stated intervals, and their progress from one class to another be under the control of the committee, and not left, as is too often the case, to the caprice of the pupil. The teacher should also be enjoined to keep a register of the attendance at his class, and these reports should be regularly produced at every meeting of the committee.

It may be said that such a system would involve more trouble than many men would like to undertake, but no success in this world is achieved without trouble, and if men undertake an office involving duties they should perform them, or cease to complain because their neglect is followed by failure. Huddersfield is not a town of very large population, nor does it possess any peculiar advantages over very many other towns; yet its Mechanics' Institute has often been referred to as a model of success in class instruction, and it was chosen by the Society of Arts as the place for their first experiment of a Local Examination.

It has about eighteen classes meeting every evening, or nearly ninety in the week, with nearly a thousand pupils receiving instruction in various departments, and most of them engaged during the day-time in earning their means of subsistence. Such an educational establishment has not been raised to its present state of efficiency by drawing up rules and leaving them to be carried out or not as it may happen. It has not only an active and intelligent secretary, but an energetic committee, who pride themselves on the punctuality with which their duties are performed, and they are rewarded by the success which results from their labours.

From small beginnings it has risen, by continued exertions and systematic attention, to its present eminence, and the mode of management is well-deserving the attention of those who are desirous of making Mechanics' Institutes really efficient for the purposes for which they are designed. In every town or village they may enjoy the advantages of such a system, and much may be done by that regular supervision which I have alluded to,

render classes more successful than is usually the case. Each individual member of the committee should feel that he has undertaken a responsibility, and not the least important of his duties is to ascertain by actual inspection the regular attendance of both teachers and pupils in the classes. If this duty be performed, one feature of the Institute will prove satisfactory, and one step be gained towards the attainment of the object for which it was established. I am, &c.,

BARNETT BLAKE.

Leeds.

Proceedings of Institutions.

CROSBY HALL EVENING CLASSES, LONDON.—The following letter has been addressed to the Editor of the *Journal*, by the Rev. Charles Mackenzie, Honorary Secretary to these Classes:—

"CROSBY-HALL, E.C., Oct. 14, 1858.
SIR,—In your notice of our proceedings (which I am thankful to see in your *Journal* of yesterday) there is a misprint, which may lead to misconception, but which is not attributable to your printer. Our report in our '*Journal*,' No. 15, Oct. 2, makes it appear that we had—

	Members.	£	s	d
In Michaelmas Term, 1857	... 672	paying	263	0 6
In Lent	" 1858	... 70	"	223 0 0
In Trinity	"	... 50	"	180 13 6

"Whereas, the MS. stated more correctly:—

Michaelmas	... 672	... £263	0 6
Lent	... 735	... 223	0 0
Trinity	... 506	... 180	13 6

"We endeavoured to correct this error of the press in No. 16 of our '*Journal*,' published on the 9th inst., but it is no wonder that it escaped your notice.—I am, &c.,

"C. MACKENZIE, Hon. Sec."

MANCHESTER MECHANICS' INSTITUTE.—A meeting was held at this Institution on Monday evening last, the 18th inst., for the purpose of distributing the certificates awarded by the Council of the Society of Arts to students in the Manchester Mechanics' Institution. These honours were distributed by the Earl of Carlisle, K.G. Mr. Oliver Heywood, president of the Institution, occupied the chair; and there were present Mr. Mackie, the Mayor of Manchester; Mr. Harvey, Mayor of Salford; Sir G. Armitage, Sir J. Watts, Mr. Fairbairn, C.E., F.R.S.; Professor Greenwood, Principal of Owens College; Mr. L. Horner, the Rev. W. Gaskell, Mr. J. Haron, the Rev. Canon Richson, Mr. Bazley, and many of the members and friends of the Institution.—The CHAIRMAN said it was proper to enhance—if the presence of such an assemblage as this could enhance—the gratification and distinction of the victors in the recent competition for testimonials of proficiency. At the same time, those who had been unsuccessful were not to be overlooked. Many of them were men of considerable talent and ability; they were present as generous witnesses of their competitors' distinction, and they were also diligently preparing themselves for the renewed contest of next year. They needed not to be told that disappointment was the way through which most men had attained success. What would have been the position of this institution itself had its conductors been unmindful of this encouragement to perseverance? After referring to the merits of the educational experiments which are in process all over the country, the chairman said that the late examination, the third under the auspices of the Society of Arts, was the first in which members of this institution had competed. There were about 1,000 candidates, of whom this Institution sent 36. Of that number, eight failed to pass the preliminary examination, and ten of the remainder gained 19 certificates. The total number of papers sent in by the 28 was 47, many of the successful candidates having entered themselves for ex-

amination in several subjects. The simple and more useful subjects were not passed by for the higher branches of study; for the preliminary examinations were passed by the 28 with great credit. There might, however, have been some aiming too high, for while there was but one paper in chemistry, one in practical mechanics, and one in book-keeping, there were seven in geometry, and eight in algebra. It was reassuring, however, to perceive, on analysing the results, that those who competed in a plurality of subjects had been successful in a fair proportion. Mr. R. RUMNEY, the chairman of the class committee, stated that the educational department of the institution consisted of three divisions. First were the female day classes, which were commenced many years ago, for the purpose of giving a sound practical education to the daughters of adult members of the artizan class. These classes had been eminently successful, and they now contained as many as could be accommodated. There were at present 260 girls and young women receiving daily instruction from thirteen teachers, ten of whom had received almost their entire education in the institution. The boy's department had only been established since the opening of the new building. A person who sent his sons to be taught at the Institution had declared that for a subscription of 17s. a quarter, including membership, they were receiving quite as good, if not better education, than they had got at a school for which he had paid £12 per annum. There were 200 boys in attendance, and their classes were conducted very efficiently. In the evening classes an alteration had been made. The plan of conducting them formerly was to teach the members individually. Now the collective system was adopted, and by a proper sub-division of the members of those classes, and a frequent use of the black-board, several advantages were gained. The directors had great faith in the use of the chalk and black board; they believed there could be no efficient teaching of large classes without the general use of them, and in their selection of teachers they had had special regard to ability in handling these two instruments effectively. In Mr. Angell, the principal of these classes, they had secured a gentleman who could use both chalk and black-board with remarkable results, and such as he (Mr. Rumney) had never witnessed before. The Earl of CARLISLE expressed how much pleasure he felt in having this opportunity of paying his respects and homage to old acquaintance. It was now—he feared it must be confessed—above a quarter of a century since he paid his last visit to the members of the Mechanics' Institute of Manchester. He was delighted to find how much more handsomely and commodiously the members were now accommodated, and he did not see why they should not all enter into an engagement with each other to meet again at the end of another quarter of a century. At the end of that time no doubt it would be impossible for any room to contain their greatly augmented numbers short of the great Free Trade Hall. He heard the most favourable reports of the progress of the institution and of the benefits it had been privileged to confer upon the important and populous district in the heart of which it was established. A most pleasing thing it certainly was to find that in a town like Manchester, the foremost town in all the world for mechanical invention and ingenuity—which invention and ingenuity could not be better represented than by the eminent gentleman near him, Mr. William Fairbairn—that in such a town, absorbed necessarily to a great extent in material pursuits, there was suitable provision made for the intellectual, the mental, and the higher qualities of our nature. Amongst the many institutions in the city having this elevating mission in view, there was every reason to believe that the Mechanics' Institute most creditably and laudably performed its part. He learnt that, besides the general arrangements of a mechanics' institute—its reading and news-room, and its library of books—they had female day classes, which, at the period of their last report, contained 219 pupils; besides which, there were

persons giving their attention to special branches of instruction, such as music, dancing, drawing, modelling, French, and even millinery—no doubt an important pursuit in its way—a number of persons which, with the day classes, raised the whole number to 441; that the evening male classes were attended by no less than 833 students, and that there were classes for boys which comprehended 166 pupils. He believed these last classes had only been nine months in operation; they were now increasing, and with a longer period of time before them, they would show how well they could earn their honours. He found that there was attached to the institution a working man's college, which he trusted was destined to confer solid advantage upon the great working community of the town. He thought it important that the directors and members should study how to make their institution attractive and amusing—he almost shrunk from using that word—but he meant “cosy”—as well as dignified and instructive. If it was thus furnished with all the attractions which, consistently with its character and constitution, it was capable of, the directors would not then compel, but induce people to come to and maintain their connexion with it. This bore upon the question of the propriety and advantage of keeping up as much social intercourse as possible, and the friends and members of all such institutions would show great wisdom in promoting such a spirit of good fellowship, and in maintaining as much *esprit de corps* as possible. He rejoiced that the institution still continued to be managed by directors elected by the members from their own body, for that was the way, he was confident, of giving satisfaction and inspiring interest. They had been told that of the 28 candidates from the institution, at the recent examination of the Society of Arts, 10 succeeded and 18 failed. Though failure could never be looked upon as a pleasing subject for comment, he yet did not think it to be regretted that there should, particularly at the outset of such examinations, be a certain proportion of failures. They showed that the work was done in earnest—that there was no sham about it; in fact, the giving too large a number of prizes or certificates took away all the real value and honour of such distinctions. Those young persons—he supposed they were mostly so—upon whom were to be conferred honours that evening, he would cordially congratulate upon their success; and he would earnestly exhort them to pursue the honourable and laudable career upon which they seemed to have entered. He would impress upon all—both on those upon whom he was about to confer these well-earned marks of honour and distinction, and those who had laudably, although not in this instance successfully, engaged in the struggle—that wherever their after destinies might carry them, the work of education, properly so considered, did not terminate with the class room, or the professor's lecture, or the institute. Every succeeding day of their lives might add to their knowledge, and every passing moment of their time might promote their personal improvement. They should strive, by every means in their power, to attain to the highest degree of usefulness to the generation in which they lived. But at the same time, while they strained their utmost endeavours to attain the highest degree of usefulness, they should be content with any opportunity they had of being useful, even in the humblest way. The statues of Watt and Dalton adorned one of the noble spaces in that town; but it was not everyone that could hope to be a Watt or a Dalton, any more than it was given to any set of men to become Shakespeares or Miltons:—

“For not to one in this benighted age,
Is that divine inspiration given,
That glows in Milton's or in Shakespeare's page—
The pomp and prodigality of Heaven.”

But because they could not attain to the very brightest and most immortal chaplets of literature, that was no reason why the common, smooth, and current paths of

literature and of knowledge should be neglected. The aristocracy of genius was indeed more limited than all the other aristocracies. But the aristocracy of virtue had this peculiarity in it, differing from all other aristocracies—that it might be co-extensive with all mankind; and it was their own fault if they did not each of them make one of that peerless aristocracy.—The noble earl then proceeded to distribute the certificates, and the meeting terminated with votes of thanks to the Earl of Carlisle and to the Chairman.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Oct. 15, 1858.]

Dated 6th September, 1858.

2014. J. Fielden, Woodhouse, near Todmorden, Lancashire—An imp. or imps. in the construction or building of coops, whether of cotton, flax, silk wool, or other fibrous materials, and also for certain utensils thereunto conducting or belonging.

Dated 9th September, 1858.

2042. W. Taylor and P. A. Baugh, Nursling, Hampshire—An improved apparatus for propelling ships or other navigable vessels through water.

Dated 17th September, 1858.

2100. G. Prax, Paris—Imp. in apparatus for separating the liquid from the solid portions of fecal matters.

Dated 18th September, 1858.

2106. J. Luis, 18, Welbeck-street, Cavendish-square—A new manner for applying centrifugal force in the manufacture of the fecula of potatoes, of starch, of yeast, of porcelain paste, of paper pulp, and ultramarine, and the apparatus for carrying out the same. (A com.)

2108. J. B. Beasley, Cahel, Ireland—Imp. in the construction of sporting and all other guns.

2110. H. W. Grylls, 47, Mark-lane—Imp. in apparatus employed in submerging or laying down electric telegraph cables.

Dated 20th September, 1858.

2114. H. Firmin, Wapping—A machine for cleansing chaff and other food for horses and cattle.

Dated 21st September, 1858.

2116. G. M. Levi, Maida-vale, Middlesex—Imp. in the manufacture of iron in the blast furnace. (A com.)

2118. G. Dowler, Birmingham, and T. T. Chellingsworth, West Bromwich, Staffordshire—An adjustable torsion spring for doors or other purposes.

2120. J. C. E. Malvestin, Paris—Imp. in the manufacture of tubes, pipes, or mains, for conducting liquids or gas, or for other similar purposes.

2122. A. V. Newton, 66, Chancery-lane—An improved machine for sweeping carpets and floors. (A com.)

2124. A. M. Perkins, Francis-street, Gray's-inn-road—Imp. in surface condensers.

Dated 22nd September, 1858.

2126. T. B. Hubbell, Regent-street—An imp. in hooped petticoats. (A com.)

2130. R. A. Brooman, 166, Fleet-street—Imp. in apparatus for printing shawls and other articles. (A com.)

2134. J. Spence, Liverpool—Imp. in the manufacture of steel, and in the furnaces employed in such manufacture.

Dated 23rd September, 1858.

2138. Earl of Darnley, 12, Queen's-gate, South Kensington—An improved machinery or apparatus for tilling and preparing land for cultivation.

2138. H. McGrady, 21, Bridge street, Blackfriars—Imp. in the construction of flues, boiler and other furnaces, and in certain appliances thereto.

2140. D. Grant, Ludgate-hill—Imp. in colour-printing presses.

Dated 24th September, 1858.

2142. P. Pickering, Danzig, Prussia—An atmospheric engine.

2143. R. Ford and W. Ford, 4, Nelson-street, Perth, Scotland—Smoke consuming by means of a reciprocating or reversing fire.

2145. R. A. Brooman, 166, Fleet-street—Imp. in the manufacture of pile and cut pile fabrics, and in machinery employed therein. (A com.)

2146. H. H. Henson and W. F. Henson, 38, Parliament-street—Imp. in waterproofing leather woven fabrics, fibrous and other materials, and also for rendering them fire-proof, or partially fire-proof.

2147. R. Bodmer, 2, Thavies-inn, Holborn—An improved apparatus for preventing explosions in steam boilers. (A com.)

2148. C. F. Vasserot, 45, Essex-street, Strand—Imp. in the construction of spinning cards. (A com.)

2149. W. Richards, Birmingham—Imp. in fire-arms and cartridges.

2150. G. L. Fuller, Lombard-street—Imp. in steam engines.

2151. G. L. Turney, Aldermanbury—An improved mode of packing pins for sale.

Dated 25th September, 1858.

2153. R. Romaine, 12, Chapel-street, Bedford-row—Imp. in the construction of steam cultivators, and in the means for operating such and other locomotive steam engines.

2155. E. Faracombe, Lambeth—Imp. in Milliputan fire-arms.

2157. W. Clark, 53, Chancery-lane—Imp. in purifying natural phosphates of lime. (A com.)

Dated 27th September, 1858.

2159. S. H. Greaves, Radford-street Works, Sheffield—Imp. in the mode of manufacturing the blades of table and other knives.

2161. W. Lander, Bristol—Imp. in engraving and printing, for the purpose of ornamenting china and earthenware.

2163. W. E. Newton, 66, Chancery-lane—Imp. in cigar holder a mouth piece for cigars, and in pipes for smoking tobacco. (A com.)

Dated 28th September, 1858.

2165. B. Jones, York—Imp. in press wheel rollers or cold cranks, which imps. are also applicable to rollers for crushing, bruising, and pulverizing roots and other substances.

2167. G. Mead, 7, Westside, Cambridge-road, Bethnal-green—Imp. in the construction of tobacco pipes.

Dated 29th September, 1858.

2169. J. Manning, Cambridge, and T. Paul, Houghton, Huntingdonshire—An improved stone staff to be used in dressing millstones.

2171. G. Old, Aston, near Birmingham, and T. Fendleton, Minton—Imp. in dress-fastenings, and in attaching dress-fastenings to articles of dress.

Dated 30th September, 1858.

2173. T. Britt, 9, St. Thomas-terrace, Church-street, Old Kent-road, Camberwell—An imp. in the propelling of steam-boats.

2175. J. Morrison, Birmingham—An imp. in, or addition to, sewing machines.

2177. L. Cecconi, 12, Great Newport-street—Imp. in the construction of cornets, trumpets, horns, and other wind instruments of like nature.

2179. R. Levy, Manchester—Imp. in the manufacture of coats, riding habits, and other similar garments.

2181. A. Normand, Havre, France—Constructing ships and vessels propelled by screw or such like propellers.

2183. J. J. Russell, Wednesbury, Staffordshire—Imp. in furnaces for heating iron and steel, suitable for the manufacture of welded tubes and other articles.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2249. C. E. Ball, Wells, Norfolk—An apparatus for combining and preserving articles of value from loss or damage in case of shipwreck.—8th October, 1858.

2265. A. Von Schutenbach, St. Petersburg—Imp. in lamps.—12th October, 1858.

2277. M. Sautter, Paris, Boulevard Montmartre, 14—Imp. in engines.—12th October, 1858.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Oct. 15, 1858.]

October 15th.	973. A. Smith.
708. J. H. Johnson.	1020. J. Castle.
818. J. Meyers.	1038. R. B. Goldsworthy.
820. W. E. Newton.	1112. W. E. Newton.
848. J. G. Jennings.	1166. C. F. D. Monahan.
881. W. H. Ridgway.	1202. M. A. F. Menzies.
854. H. Edwards.	1320. W. Davis.
873. M. Ross.	1650. L. J. Marks.
942. M. A. F. Menzies.	1764. A. V. Newton.
944. E. Tomlinson.	1971. M. A. F. Menzies.
961. J. Chadwick A. Elliott, and W. Robertson.	

[From Gazette, Oct. 19, 1858.]

October 18th.	926. E. White.
876. J. Horsey.	946. W. Clark.
877. E. Green & E. Green, jun.	969. D. Auld.
879. B. Parker.	969. W. Clark.
880. W. Bishop.	987. W. Clark.
883. J. Chatterton.	1021. R. Openhaw.
884. G. Gilmour.	1169. W. Harding.
887. P. Maughey.	1177. J. Luke.
890. P. E. Almont.	1329. W. E. Newton.
892. J. B. Paddon.	1454. J. Morgan.
894. T. Donkin.	1603. T. Leigh.
897. C. Atkinson.	1834. T. Greenwood, J. Baker, and J. Salt.
898. H. J. Sillem.	1724. H. Bessemer.
899. J. P. Pirson.	1769. J. J. Russell.
903. C. Langley.	1810. H. Clayton.
904. A. S. Stocker.	1925. J. Biggs.
908. F. Lillywhite & J. Widen.	1977. J. H. Johnson.
914. J. M. Fisher.	1979. William Ross.
916. J. Westerby.	

PATENTS ON WHICH THE STAMP DUTY OF £40 HAS BEEN PAID.

[From Gazette, Oct. 15, 1858.]

October 11th.	2337. Dr. Graham.
2296. G. T. Bousfield.	October 12th.
2298. G. T. Bousfield.	2302. T. W. Dods.

[From Gazette, Oct. 19, 1858.]

October 14th.	2327. H. Bessemer.
2311. E. Wilkinson.	2381. J. Adcock.
2317. H. Bessemer.	2389. A. Parks.
2319. H. Bessemer.	October 16th.
October 16th.	2338. S. Southam.
2321. H. Bessemer.	2346. W. Smith.
2325. H. Bessemer.	2346. W. Bedford.

Journal of the Society of Arts.

FRIDAY, OCTOBER 29, 1858.

MEETING OF COUNCIL.

At a Meeting of the Council, held on Wednesday last, the following Institutions were received into Union:—

Bristol, Young Men's Christian Association and Literary Institute.
Villenhall, Reading and Literary Society.

PHOTOGLYPHIC ENGRAVING.

The following is a description of Mr. Fox Talbot's new discovery of a means by which a photograph may be transferred direct to copper or steel plate, taken from the specification of the patent which has just been enrolled:—

"In this invention I employ plates of steel, copper, or iron, such as are commonly used by engravers. Before using a plate its surface should be well cleaned; it should then be rubbed with a linen cloth, dipped in a mixture of caustic, soda, and whiting, in order to remove any remaining trace of greasiness. The plate is then to be rubbed dry with another linen cloth. This process is then to be repeated; after which the plate is in general sufficiently clean.

"In order to engrave a plate I first cover it with a substance which is sensitive to light. This is prepared as follows:—About a quarter of an ounce of gelatine is dissolved in eight or ten ounces of water, by the aid of heat. To this solution is added about one ounce, by measure, of a saturated solution of bichromate of potash in water, and the mixture is strained through a linen cloth. The best sort of gelatine for the purpose is that used by cooks and confectioners, and commonly sold under the name of gelatine. In default of this, isinglass may be used, but it does not answer so well. Some specimens of isinglass have an acidity, which slightly corrodes and injures the metal plates. If this accident occurs, ammonia should be added to the mixture, which will be found to correct it. This mixture of gelatine and bichromate of potash keeps good for several months, owing to the antiseptic and preserving power of the bichromate. It remains liquid and ready for use at any time during the summer months; but in cold weather it becomes a jelly, and has to be warmed before using it; it should be kept in a cupboard or dark place. The proportions given above are convenient, but they may be considerably varied without injuring the result. The engraving process should be carried on in a partially darkened room, and is performed as follows:—A little of the prepared gelatine is poured on the plate to be engraved, which is then held vertical, and the superfluous liquid allowed to drain off at one of the corners of the plate. It is held in a horizontal position over a spirit lamp, which soon dries the gelatine, which is left as a thin film, of a pale yellow colour, covering the metallic surface, and generally bordered with several narrow bands of prismatic colours. These colours are of use to the operator by enabling him to judge of the thinness of the film; when it is very thin, the prismatic colours are seen over the whole surface of the plate. Such plates then make excellent engravings; nevertheless, it is perhaps safer to use gelatine films which are a little thicker. Experience alone can guide the operator to the best result. The object to be engraved is then laid on the metal plate, and screwed down upon it in a photographic copying frame. Such objects may be either material

substances, as lace, the leaves of plants, &c., or they may be engravings, or writings, or photographs, &c. The plate, bearing the object upon it, is then to be placed in the sunshine, for a space of time varying from one to several minutes, according to circumstances; or else it may be placed in common daylight, but of course for a long time. As in other photographic processes, the judgment of the operator is here called into play, and his experience guides him as to the proper time of exposure to the light. When the frame is withdrawn from the light, and the object removed from the plate, a faint image is seen upon it—the yellow colour of the gelatine having turned brown wherever the light has acted. This process, so far as I have yet described it, is, in all essential respects, identical with that which I described in the specification of my former patent for improvements in engraving, bearing date the 29th October, 1852.

"The novelty of the present invention consists in the improved method by which the photographic image, obtained in the manner above described, is engraved upon the metal plate. The first of these improvements is as follows:—I formerly supposed that it was necessary to wash the plate bearing the photographic image in water, or in a mixture of water and alcohol, which dissolves only those portions of the gelatine on which the light has not acted; and I believe that all other persons who have employed this method of engraving, by means of gelatine and bichromate of potash, have followed the same method, viz., that of washing the photographic image. But however carefully this process is conducted, it is frequently found, when the plate is again dry, that a slight disturbance of the image has occurred, which, of course, is injurious to the beauty of the result; and I have now ascertained that it is not at all necessary to wash the photographic image; on the contrary, much more beautiful engravings are obtained upon plates that have not been washed, because the more delicate lines and details of the picture have not been at all disturbed. The process which I now employ is as follows:—When the plate bearing the photographic image is removed from the copying-frame, I spread over its surface, carefully and very evenly, a little finely-powdered gum-copal (in default of which common resin may be employed). It is much easier to spread this resinous powder evenly upon the surface of the gelatine than it is to do so upon the naked surface of a metal plate. The chief error the operator has to guard against is that of putting on too much of the powder; the best results are obtained by using a very thin layer of it, provided it is uniformly distributed. If too much of the powder is laid on, it impedes the action of the etching liquid. When the plate has been thus very thinly powdered with copal, it is held horizontally over a spirit-lamp, in order to melt the copal; this requires a considerable heat. It might be supposed that this heating of the plate, after the formation of a delicate photographic image upon it, would disturb and injure that image, but it has no such effect. The melting of the copal is known by the change of colour. The plate should then be withdrawn from the lamp, and suffered to cool. This process may be called the laying of an aquatint ground upon the gelatine, and I believe it to be a new process. In the common mode of laying an aquatint ground, the resinous particles are laid upon the naked surface of the metal, before the engraving is commenced. The gelatine being thus covered with a layer of copal, disseminated uniformly and in minute particles, the etching liquid is to be poured on. This is prepared as follows:—Muric acid, otherwise called hydrochloric acid, is saturated with peroxide of iron, as much as it will dissolve with the aid of heat. After straining the solution, to remove impurities, it is evaporated till it is considerably reduced in volume, and is then poured off into bottles of a convenient capacity; as it cools it solidifies into a brown semi-crystalline mass. The bottles are then well corked up, and kept for use. I shall call this pre-

paration of iron by the name of perchloride of iron, in the present specification, as I believe it to be identical with the substance described by chemical authors under that name, for example, see 'Turner's Chemistry,' fifth edition, page 537; and by others called permuriate of iron; for example, see 'Brande's Manual of Chemistry,' second edition, vol. ii., page 117.

"It is a substance very attractive of moisture. When a little of it is taken from a bottle, in the form of a dry powder, and laid upon a plate, it quickly deliquesces, absorbing the atmospheric moisture. In solution in water, it forms a yellow liquid in small thicknesses, but chestnut-brown in greater thicknesses. In order to render its mode of action in photoglyphic engraving more intelligible, I will first state that it can be usefully employed in common etching; that is to say, that if a plate of copper, steel, or zinc is covered with an etching-ground, and lines are traced on it with a needle's point, so as to form any artistic subject, then, if the solution of perchloride of iron is poured on, it quickly effects an etching, and does this without disengaging bubbles of gas or causing any smell; for which reason it is much more convenient to use than aquafortis, and also because it does not injure the operator's hands or his clothes if spilt upon them. It may be employed of various strengths for common etching, but requires peculiar management for photoglyphic engraving; and, as the success of that mode of engraving chiefly turns upon this point, it should be well attended to.

"Water dissolves an extraordinary quantity of perchloride of iron, sometimes evolving much heat in the solution. I find that the following is a convenient way of proceeding:—

"A bottle (No. 1) is filled with a saturated solution of perchloride of iron in water.

"A bottle (No. 2) with a mixture, consisting of five or six parts of the saturated solution and one part of water.

"And a bottle (No. 3) with a weaker liquid, consisting of equal parts of water and the saturated solution. Before attempting an engraving of importance, it is almost essential to make preliminary trials, in order to ascertain that these liquids are of the proper strengths. These trials I shall therefore now proceed to point out. I have already explained how the photographic image is made on the surface of the gelatine, and covered with a thin layer of powdered copal or resin, which is then melted by holding the plate over a lamp. When the plate has become perfectly cold, it is ready for the etching process, which is performed as follows:—A quantity of the solution in bottle No. 2, viz., that consisting of five or six parts of saturated solution to one of water, is poured upon the plate, and spread with a camel-hair brush evenly all over it. It is not necessary to make a wall of wax round the plate, because the quantity of liquid employed is so small that it has no tendency to run off the plate. The liquid penetrates the gelatine wherever the light has not acted on it, but it refuses to penetrate those parts upon which the light has sufficiently acted. It is upon this remarkable fact that the art of photoglyphic engraving is mainly founded. In about a minute the etching is seen to begin, which is known by the parts etched turning dark brown or black, and then it spreads over the whole plate—the details of the picture appearing with great rapidity in every quarter of it. It is not desirable that this rapidity should be too great, for, in that case, it is necessary to stop the process before the etching has acquired sufficient depth (which requires an action of some minutes' duration). If, therefore, the etching, on trial, is found to proceed too rapidly, the strength of the liquid in bottle No. 2 must be altered (by adding some of the saturated solution to it) before it is employed for another engraving; but if, on the contrary, the etching fails to occur after the lapse of some minutes, or if it begins, but proceeds too slowly, this is a sign that the liquid in bottle No. 2 is too strong, and too nearly approaching saturation. To correct this, a little water

must be added to it before it is employed for another engraving. But, in doing this, the operator must take notice, that a very minute quantity of water added afterwards makes a great difference, and causes the liquid to run very rapidly. He will therefore be careful, in adding water, not to do so too freely. When the proper strength of the solution in bottle No. 2 has thus been adjusted, which generally requires three or four experimental trials, it can be employed with security. Supposing then, that it has been ascertained to be of the right strength, the etching is commenced as above mentioned, and proceeds till all the details of the picture have become visible, and present a satisfactory appearance to the eye of the operator, which generally occurs in two or three minutes, the operator stirring the liquid all the time with a camel-hair brush, and thus slightly rubbing the surface of the gelatine, which has a good effect. When it seems likely that the etching will improve no further it must be stopped. This is done by wiping off the liquid with cotton wool and then rapidly pouring a stream of water over the plate, which carries off all the remainder of it. The plate is then wiped with a clean linen cloth and then rubbed with soft whiting and water to remove the gelatine. The etching is then found to be completed.

"I will now describe another etching process, very slightly differing from the former, which I often use. When the plate is ready for etching, pour upon it a small quantity of the liquid (No. 1—the saturated solution.) This should be allowed to rest upon the plate one or two minutes. It has no very apparent effect, but it acts usefully in hardening the gelatine. It is then poured off from the plate, and a sufficient quantity of solution (No. 2) is poured on. This effects the etching in the manner before described, and, if this appears to be quite satisfactory, nothing further is required to be done. But it often happens that certain faint portions of the engraving, such as distant mountains or buildings in a landscape, refuse to appear; and as the engraving would be imperfect without them, I recommend the operator, in that case, to take some of the weak liquid (No. 3) in a little saucer, and without pouring off the liquid (No. 2) which is etching the picture, to touch with a camel-hair brush, dipped in liquid No. 3, those points of the picture where he wishes for an increased effect. This simple process often causes the wished for details to appear, without, sometimes, with great rapidity, so that caution is required in the operator, in using this weak solution (No. 3) especially, lest the etching liquid should penetrate to the parts which ought to remain white; but, in skilled hands, its employment cannot fail to be advantageous for it brings out soft and faint shadings, which improve the engraving, and which would otherwise probably be lost. Experience is requisite in this, as in most other delicate operations connected with photography, but I have endeavoured clearly to explain the leading principles of this new process of engraving, according to the method I have hitherto found the most successful."

BRITISH ASSOCIATION, LEEDS, 1858.

REAPING MACHINERY.

The following paper was read before the Mechanical Section by Alfred Crosskill:—

The paper on Reaping Machinery which I read before the Mechanical Section in the year 1858, at the meeting of the British Association in Hull, contained a general history of all the early inventions for reaping on record, none of which excited any interest, or were generally known to the public, prior to the Great Exhibition of 1851, when the introduction there of two reaping machines from America drew general attention to the subject. Mr. Garrett, Messrs. Ransomes (of Ipswich), Mr. Samuelson, and the father of the writer (Mr. William

Croskill) immediately took a prominent part in introducing reaping machinery into the harvest-fields of this country; and Mr. Croskill succeeded in bringing into general notice, and subsequently into practical operation, a reaper which had been in existence in Scotland, and worked there by its owner, for nearly twenty years, but which, for want of practical knowledge in perfecting its mechanical construction, had scarcely been heard of during that time beyond the limits of the district in which it was originally put together.

The two American reapers, known respectively as Hussey's and M'Cormick's, and the Scotch machine, called "Bell's," after its originator, who was a minister in Fifeshire, were in 1853 the only implements capable of doing any practical work in the harvest-fields; and though they have during the succeeding five years been greatly improved, modified, and re-constructed as experience has shown to be necessary to meet the varied requirements of English agriculture, they still retain their distinctive peculiarities sufficiently to divide reaping machines into three separate classes or varieties, and all the schemes and novelties which have been brought forward since the year 1852 have either failed and been laid aside, or have resolved themselves into variations of one of the three machines first established.

Before describing the fundamental differences in the construction of these three reapers, and briefly indicating the important improvements that have been made in them since their introduction, it is desirable briefly to point out the work which has to be accomplished by an efficient machine for reaping. Most inventors or mechanics who for the first time turn their attention to this subject occupy themselves almost exclusively with the cutting apparatus, apparently overlooking that the convenient disposal or delivery of the cut corn is a very important part of the functions of reaping machines, and has, in fact, been the real difficulty in bringing them into practical use. The cutting parts of all the reapers have for a length of time been sufficiently perfect to encounter successfully every crop that they can reasonably be required to cut; but to obtain an efficient means of delivery has taxed to the utmost the patience, perseverance, and ingenuity of all who have been engaged with the subject, and considerable difficulty has been experienced in perfecting an arrangement that will satisfactorily deliver all descriptions of grain.

The only efficient cutting apparatus hitherto brought into practical use consists of a series of V-shaped knives fixed side by side on a light moveable bar, extending across the whole width of the front part of the reapers, and connected, by means of gearing and a crank, to the main wheels which carry them, so that as they travel forwards a rapid reciprocating motion is communicated to the knives. They pass between and cut against fixed guards or fingers, which support the straw and prevent it from yielding sideways, and serve also to protect the knives from injury on rough and stony ground.

The shape of the knives varies in the different machines; in Hussey's they form a very acute angle with the guards, are plain-edged, sharp, and chop off the straw by means of their rapid motion through the ingers. Mr. M'Cormick's knife has a serrated edge with an obtuse angle, and requires the aid of a fan or reel to hold the corn in order to cut clean, but it is much more easily worked, more durable, and less liable to choke, than Hussey's, and by those who have tried both is generally preferred. Bell's original machine cut by means of shears resembling large sissors; but though very efficient in operation they were found difficult to keep in order, and a serrated knife something like M'Cormick's was substituted for the shears in the year 1854, and has been successfully used since that time. An inspection of the models will enable any one to understand the general action of the cutters and guards, and the special difference between each variety of knives shown by the specimens on the table.

It is worthy of remark in connection with the cutting apparatus, that numerous endeavours have from time to time been made to supersede the necessity of giving a reciprocating motion to the knives, as the reverse action is a source of considerable loss of power, and the tremulous vibration it produces in the machines is a great cause of their wear and tear. All attempts have, however, hitherto failed in producing an efficient cutter with a continuous motion, and in the opinion of the writer there is little probability of their success, as actual experience in the harvest-field seems to prove that the reverse or reciprocating motion of the bar and knives is necessary to shake out from the guards pieces of short straw, grass, weeds, and other substances which constantly collect there, and if not quickly removed soon choke them up and stop the action of the cutters. A complete collection of all the schemes known to have been projected for cutting corn, was published by Mr. Woodcroft, of the Patent Office, in the year 1852, and forms a record worthy of the attention of the curious in such matters; it should serve also as a warning to inventors generally to make actual trials of their crude schemes before wasting their money in taking out patents for them, as the great majority turn out entirely worthless in practice.

The different methods of delivering the cut corn will be best understood from a brief description of how it is disposed of by each machine, beginning with Hussey's, which is the simplest, and may be termed the elementary reaper. In this implement the corn falls, as it is cut, upon a platform behind the knives; a man rides on the box which covers the wheels and other gearing, and forms a seat for him; and as soon as a sufficient quantity has collected to form a sheaf, he pushes it off the platform by means of a rake with which he is provided. When this operation is performed by a skilful workman on a moderately light crop, which can be managed without too much exertion, it has a particularly neat and tidy appearance, the corn is left in sheaves, ready for binding immediately; and the result is attained by the simplest possible means, as there is no gearing required except that for driving the cutters; and the simplicity of the implement contrasts strikingly with others which have machinery necessarily more or less complicated for effecting the delivery of the cut corn. On the other hand, to do the work neatly and efficiently, requires a man both strong and skilful, especially where the crops are heavy, and such a man is not always to be obtained. It is, therefore, not surprising that this machine is much better liked in America, where the crops are generally thin and light, than in this country, where on all good farms the weight of the produce is too great to admit of its being readily moved as fast as cut by the unaided strength of a single workman. It will also be observed that the sheaves are deposited on the ground behind the machine, and must therefore be removed out of the way of the horses before they can pass to make the next cut; and in practice this is found a great disadvantage in comparison with the work of the machines with self-acting deliveries, which deposit the cut corn on one side, so that its instant removal is not necessary.

M'Cormick's reaper, as first introduced from America in 1851, resembled Hussey's in requiring a man to ride on it for the purpose of raking off the cut corn, but the gearing was placed before the platform, so that the sheaves could be raked off to the side of the machine, where they were out of the way of the horses when making the next cut; but the work of the man was far more laborious than with Hussey's reaper; and in most of the heavy crops of this country it could not be performed. This difficulty with M'Cormick's machine was overcome by Messrs. Burgess and Key, of London, who constructed and patented for it a self-acting apparatus for delivering, consisting of three rollers in the form of endless screws, which carry the cut corn off at the side of the machine, and leave it in a continuous swath ready for taking up and binding. The engraving of the reaper at work shows

the action of the screw delivery, and is a very good representation of the implement drawn by two horses and driven by a boy. Since the introduction of Measars, Burgess and Key's improvements, this machine has been very extensively used; and when managed with proper care and attention, is capable of doing excellent service.

In Bell's reaper, as improved and re-constructed at Beverley, under the direction of the writer, the delivery is effected by means of a number of endless bands of vulcanized Indian rubber, fitted with projecting pieces of wood, which carry the cut corn to the side of the machine and deposit it on the ground in a regular and continuous swathe, as shown in the engraving. In the original machine a cloth carried along by pitch chains was employed for this purpose, but the bands are found equally efficient, not so liable to get out of order, and more easily worked by the horses than the cloth and pitch-chains. The large model on the table is fitted with the shears and the cloth, as used in the original machine; the small models show the improvements which have been made in it, and the form in which it has been practically found to work best.

It will be observed that both the machines, with self-acting delivery, leave the corn in a continuous swathe, which must be raked together for binding, and a practically useful intermittent, or sheaf-delivery has not yet been effected by machinery, although several attempts have, from time to time, been made to accomplish it.

A cursory inspection of the models and engravings shows a striking difference in the general arrangement and construction between Bell's reaper and that of both the American machines just described. In the latter the horses walk by the side of the corn to be cut, and draw by means of a pole connected to one side or end of the machine, a mode of attachment productive of considerable twist or torsion, especially when the work is severe. Bell's machine goes before the horses, and is propelled by means of a long pole passing between them, to the end of which they are harnessed, and by means of which the man who follows and drives them steers the reaper in any direction. This mode of attachment is attended with the great advantage of enabling the machine to deliver the cut corn on either side, while all the reapers which have the horses in front are confined to one side only for delivery, and cannot go backward and forward along a field, but must either go round the crop, or, when circumstances render this impracticable, must return idle; on the other hand, machines having the horses in front are somewhat more manageable and easily turned than Bell's, and, in cases of need, a third horse can be yoked in front, which is not practicable when the machine is placed first. For these and other reasons connected with practical convenience, both makers and users of reapers are much divided in opinion as to which is the best way of attaching the horses. Both methods have warm advocates, and it appears probable that until considerably more experience has been gained in the practical use of reaping machinery, and perhaps even after that, on account of the variation in convenience under different circumstances, both methods will continue to be employed.

It will be observed, also, both the machines with self-acting delivery, carry in front of the cutters an apparatus called a fan or reel, which revolves slowly as the machine advances, puts back the corn, and insures its falling in the proper direction; an operation which in Hussey's machine is done, when necessary, by the man with the rake.

A general description of reaping machinery would not be complete without an allusion to various ingenious contrivances which have been projected from time to time for the purpose of delivering the cut corn. Through the kindness of Messrs. Ransomes and Sims, of Ipswich, I am enabled to exhibit a working model of one of these, consisting of a exceedingly curious automaton or self-acting reel, invented by a youth in America, named Atkins, and sent over to England in 1853. It was applied to a machine similar to Hussey's, and was in-

tended to deposit the corn on the ground in sheaves; but it has not yet been made to do so in a sufficiently perfect manner to justify its general introduction, although its extreme beauty and ingenuity lead to the hope that it will at some time be turned to account. Another machine, with a very clever contrivance for giving a self-acting motion to a rake for performing the work done by the man on Hussey's reaper, has just been sent over from the United States to Mr. Samuelson, of Banbury, by Messrs. Seymour and Morgan, of Brockport, near New York; it has been named the "Britannia Reaper," and the *North Lane Express* and other agricultural journals contained last week accounts of various successful trials that have just been made with it in the North of England. Having seen it for the first time on Monday last, I have been unable to get a model of it for exhibition here, and the mechanical arrangements are so peculiar, that a description of them would be unintelligible without a model. I may state, however, that there is every probability of its turning out practical and useful as well as ingenious, and in the hands of Mr. Samuelson we may rest assured that its capabilities will be fully developed.

In making a few observations on the practical use of reaping machinery, it is necessary to direct attention to the extremely variable and uncertain nature of the circumstances under which it has to operate. A week of heavy rain before harvest will sometimes lay the corn in whole districts, so that it cannot even be mown with a scythe, and it is not probable that machinery will ever be made to work under unfavourable circumstances of this description. It is, however, certain that the reapers as at present constructed are able to render important assistance to the farmer in moderately favourable seasons.

The use of both reaping machines with self-acting delivery is steadily extending; and as agriculturists and their men become more accustomed to them, their introduction will be still more rapid; for, owing to the high price of labour during harvest, they effect a considerable saving in the cost of cutting the crop, and enable the farmer to take more advantage of favourable weather than he can do by the uncertain aid of the limited number of men that can be procured at that period of the year.

It is also worthy of remark in connection with this part of the subject, that, excepting the locomotive engine, there is no machine in use which requires to be manufactured with so much care and regard to durability as the reaper. Almost all other machines used either in agriculture or manufactures do their work when at rest, and secured to substantial foundations. Even those constructed to move from place to place are, before being put in motion, fastened down, to prevent, as far as possible, the destructive consequences of oscillation and vibration. The reaper is, on the contrary, not only exposed to all the strains consequent on passing over every description of uneven ground with its machinery in action, but it is also subject to the effects of continual tremulous vibration, caused by the quick reciprocating motion of the knives.

It is, therefore, not surprising that the introduction of reaping machines has been attended with considerable difficulties, especially as they have had to be worked by men but little accustomed to the use of machinery. In this respect, however, the last few years have witnessed a great change. The assistance of the steam engine is already felt by most farmers to be a necessity in carrying on all extensive operations with efficiency and economy, and the general use of improved machinery cannot fail to produce a corresponding improvement in the condition of the agricultural labourer, and will accelerate the completion of that progressive revolution which, since the abrogation of legislative protection, has been rapidly taking place in every department of practical agriculture.

THE MANUFACTURE OF IRON IN THE NEIGHBOURHOOD OF LEEDS.

The following paper, by W. J. before the Mechanical Section.

The object I have had in view in collecting the following facts, is to bring before the notice of this section of the British Association a few points connected with the manufacture of pig metal and iron in the neighbourhood of this town.

As an introduction to the remarks I have to make, allow me to refer you to a paragraph in reference to this district, contained in the memoir of the "Geological Survey of Great Britain, and of the Museum of Practical Geology for 1856.

"The coal field of Yorkshire may be considered, especially in respect to its iron manufacture, as admitting of division into two parts, the northern and southern districts. In the former, the lower part of the strata is developed to a degree of importance not seen in the south, by the occurrence of the beds of ironstone and coal, which have given rise to the establishments of Lowmoor, Bierley, and Bowling, celebrated for the production of the best irons in Britain, and to that of Farnley, which is following in the same steps.

"The castings from these works are largely employed for special purposes where strength and tenacity are required, as for mortars and sea-service guns. Their wrought-iron has the peculiarity of a granular structure, with a uniform small and brilliant grain, which closely resembles the character of Swedish bars. The superiority of the North Yorkshire iron proceeds from the care and attention bestowed upon the various processes, and from the admirable character of the seam of coal termed the Better Bed, differing from ordinary seams in its remarkable freedom from iron pyrites and other impurities. You may pass through the coking heaps or ovens without the least inconvenience from the sulphurous gases, which, in the coking of most coals, are so freely liberated."

Having extracted these few remarks from the memoir alluded to, I now proceed to point out the position occupied by this valuable seam of coal in the geological strata of the Bradford and Leeds districts.

The superficial seams of coal worked in the immediate neighbourhood of Leeds are unconnected with the manufacture of the iron. I will, therefore, confine myself to a mere enumeration of these various measures in the order in which they are to be found:—

1. The stone or cannel coal.
2. The Middleton bed.
3. The Beeston thin bed.
4. The Beeston thick bed.
5. The Crow coal.

Below the latter seam of coal we arrive at that portion of the strata especially connected with the manufacture of iron in the North Yorkshire district.

A section of this part of the strata gives the following results:—

1. Loose vein of sandstone, 9 to 18ft. thick.
2. Black bed ironstone, lying in a bed of shale, 3 to 4ft.
3. Black bed coal, 2ft.
4. Various measures of shale and stone. Roof of Better Bed coal, consisting of black shale with numerous fish remains, and small white nodules of ironstone, 120ft.
5. Better bed coal, 1 to 2ft. 6in.
6. Floor of indurated fireclay, 2 to 3ft.

From this portion of the strata, comprised within the short space of 40 yards, the materials employed in the manufacture of the iron are derived. The black-bed ironstone furnishes the ore. The Better Bed coal the fuel. The black bed is used for the engines, and from the valuable bed of fireclay are made the bricks and blast furnace linings.

The ironstone occurs in detached nodules of various sizes, deposited in five distinct layers, which are designated as follows:—Top balls, flatstone, upper rough measure, middle balls, lower rough measure (small balls).

The composition of these different measures is apt to

vary. In some localities their course is difficult to trace in the surrounding shale. In others, where the seam is termed good, they appear to have been deposited with the most remarkable regularity, and to have remained undisturbed in the same state which had been assigned to them at the first formation of the strata.

In the last case the ore is worked with greater economy, and yields a larger quantity of stone per acre. 1,000 tons per acre is about the average yield at Farnley.

The fracture of this stone shows a blackish-grey tint, and yields by analysis:—

Metallic Iron	39.4	per cent.
Silica and Alumina.....	14.9	" "
Sulphur	8	" "
Oxygen, Carbonic Acid, &c.....	44.9	" "

100.0

Although it would appear from this analysis, compared with the analysis of other ores in the kingdom, that there are no peculiar properties connected with the ironstone of this district, either as regards quantity or quality, to account for the excellence of the iron produced, it is, however, worthy of remark that a singular affinity or kindliness seems to exist between the ore and the Better Bed coal. The result of trials with other ores have been anything but satisfactory.

We now come to examine the fuel employed, and the first point that strikes us in burning a piece of Better Bed coal is its freedom from sulphur.

It is a well-known fact that sulphur is one of the chief obstacles in the manufacture of iron in this country. A very small proportion of this element entering into the composition of the iron will cause the latter to be brittle, and thereby render it unfit for purposes where great strength and toughness are required.

It is to the absence of sulphur that charcoal iron owes its pre-eminence. Hence the superiority of Russian and Swedish irons, and, in general, most irons manufactured with charcoal. The Better Bed coal (in its freedom from sulphur) is, I believe, of all the coals in the United Kingdom, the one which approaches the nearest to charcoal.

I have had one sample of this coal analysed lately by Mr. Wood, of this town, and the following are the results:—

Carbon	74.700
Hydrogen.....	5.000
Sulphur .....	.196
Ash	4.700
Oxygen and Nitrogen	15.404

100.000

Other analyses will have to be repeated on different samples of this coal before the average amount of sulphur can be determined with precision.

This first essay, however, is satisfactory, inasmuch as it places the Better Bed coal of this district in the foremost rank amongst the pure coals of England, and it is (as has been stated in the memoir alluded to in the commencement) to its exclusive use as a fuel, that the good quality of the iron manufactured at Lowmoor, Bowling, and Farnley is mainly attributable.

It is not my intention, sir, to take up your valuable time by entering into the details connected with the manufacture of iron in this district, although much could be said on this subject, for much has been done. My object, however, is to bring before your notice two points of importance in connection with the process of refining the pig metal at the Farnley Iron Works, and which are peculiar to that establishment.

The first has reference to the introduction of steam into the refinery along with the blast. The results hitherto obtained by the adoption of this process are satisfactory, inasmuch as the quality of the iron has been improved; especially with regard to boiler plate.

The second point to which I desire to call your atten-

tion, is the introduction of steel into the refineries in conjunction with the pig metal.

Converted bars of steel in various proportions are melted in the refinery along with the pig. A perfect mixture is thus obtained, and the refined metal produced presents a pure silvery fracture and a perfectly homogeneous texture.

The metal thus obtained is worked with much greater facility in the puddling furnaces. A puddler operating on ordinary metal, works up 9 heats (300 lbs.) in his turn of 12 hours; whereas, with refined metal, composed of two parts pig and one part steel, he can get through 12 heats in the same time.

The stampings and lumps are then taken through the ordinary processes, and the finished iron obtained from this metal is, to all appearances, of a very superior quality. It welds and punches remarkably well, and its fracture presents a very fine close grain.

It would be premature on my part to make any comparison between the quality of this "steel iron" and that of the ordinary iron of the district, until proper and well-conducted trials have been made with respect to their strength and durability.

Messrs. Kitson and Co., of this town, have undertaken to test the boiler plate and bar iron, and two sets of locomotive tyres are now running on the London and North Western line, and Mr. McConnell has promised to give an account of the manner in which they have worn.

SUBMARINE ELECTRIC TELEGRAPH.

Mr. Henley, of Greenwich, has completed a submarine cable of 240 miles to connect the island of Tasmania with Victoria, Australia. It will be laid from Cape Otway, Victoria, to King's Island, Bass's Straits, from King's Island to the River Mersey, and from the Mersey to Georgetown Heads, the entrance to the port of Launceston, Tasmania. The conductor is covered with gutta percha, and the gutta percha serving with Russian hemp, saturated with a mixture of Stockholm tar, linseed oil, and Russian tallow. The outer covering spun round this serving of hemp consists of 10 solid iron wires. The weight of the cable is two tons to the statute mile.

SOUTH KENSINGTON MUSEUM.

During the week ending October 23, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,078; on Monday and Tuesday (free evenings), 2,006. On the three Students' days (admission to the public 6d.), 614; one Students' evening, Wednesday, 142. Total, 4,840. From the opening of the Museum, 646,460.

Home Correspondence.

THE LATE THOMAS TREDGOLD.

DEAR SIR,—The enclosed letter from the late eminent engineer, Mr. Tredgold, to a deceased friend of mine, possesses points of interest which may perhaps be acceptable to the readers of our *Journal*. If you also think so, it is quite at your service.—I am, &c.,

THOS. WINKWORTH.

Graham Club, Oct. 18, 1858.

16, Grove-place, Lissen-grove, Feb. 16, 1828.

DEAR SIR,—Algebra is to mechanics what money is to mercantile people; it enables one in small compass to keep the debtor and creditor account between power and resistance, the final equation is the balance sheet of the transaction; but, unfortunately, if either of these be shown to men in certain states of society they are considered of no value; in another state, the value of the balance sheet has become known, and seeing

that certain crooked and straight lines marked on a sheet of paper may represent the state of a man's concerns with admirable certainty, there is room for conjecture that the crooked lines of Algebra may be equally certain and valuable; but that value has no measure, because a man cannot measure the value of that he doth not comprehend; but, in such a case, he has some idea of encouraging the thing, and watching the progress of its fruits; and, verily, I would have no great objection to the schoolmaster of Neath being occasionally called into request, and to most earnestly recommend that it be done when occasion renders it desirable. I, however, knew that ancient habits and methods are not easily changed; and, therefore, reduced all the rules that would easily bear it to words at length, with easy examples, and think that any person knowing the common rules of arithmetic may calculate all the proportions of the parts of the engines usually made; but, for fear this should not be so, there are two tables of the proportions for all power from 1 to 200 horses' power of double acting engines, and from 10 to 200 horses' power for single engines. Again, if any difficulty should arise, I am within the reach of the post, and, further, would willingly add Mr. Vigurs' name to the list of my correspondents. The best thing would be for Mr. Vigurs to get the book,* make choice of the kind of engine, settle the power, or state the duty he wished it to perform, and then give me an order for a set of working drawings to execute it by; the expense of which would be at the rate of 3s per cent on the cost of the engine, and he should estimate the cost at his own rate, provided he does not get it below £20 per horse power for a 10 horses' power engine. I have made two sets of drawings for steam-engines this year, and I am happy to find that more people begin to make use of this simple and cheap means of having the ideas of a person who has devoted his life to such subjects, and has given the world samples at large to choose out of. Five per cent. is given for the plans of a house, but an engine it is much more important should be good, for otherwise it may be a source of hourly loss.

If you will be so good as to notice the parts which apply to the case and to the man, and select those which will have the most weight in determining him to have a set of drawings as well as the book, you will serve both him and me.

As a sample of the march of intellect, suppose old Robert Recorde, the first English writer on arithmetic, endeavouring to teach a merchant the use of that art, whose mind is occupied in ascertaining its advantage over the notches of his tally sticks, half inclined to think the latter the best. Set the painter to work, and exhibit at the R. Exchange for the benefit of the Robert Recordes of the day.

It is chiefly owing to being opposed to Mr. H's doctrines in some points that I have not followed the subject (of Political Economy) up so closely as I intended; there is a certain degree of not-meddling with trade which it appears to me is most desirable, but it appears equally so that when a large proportion of a population are embarked in a particular kind of trade, they should be protected from the competition of foreigners in the home market, and particularly when the commodity is one of the necessities of life; the degree of protection to be such as barely saves the home producer, that he may be induced to turn to some new line of production, for the population must either produce new articles to be equivalent to the foreign goods, or they had better continue to produce the old articles. One state is as one firm—the good of the whole is the object.

Consider this point against I have the pleasure of seeing you.

I am, dear Sir,

Your most obedient servant,

THOMAS TREDGOLD.

To John Vigurs, Esq., Cwm Avon.

WATER POWER.

SIR,—As you have been pleased to notice the paper I read at Leeds, on "The Economy of Water Power," permit me to send you a short account of an elegant and useful application of water pressure I saw at work there.

The Town-hall of Leeds contains a powerful organ, which is blown by the pressure of water from the main pipes that supply the town. A branch pipe, fitted with a regulating tap, conveys the water to the organ, where its pressure, acting against the piston of a small cylinder,

* It would be worth his while to see the book, to consider how far the new methods proposed to render the engines more simple and effective, can be adopted so as to render him successful as an engine-maker of the first rank; he having the advantage of easy access to the scientific and draughtsmen's parts, might render his works a rival of Soho.

like that of a steam-engine, produces a reciprocating motion, which blows the bellows.

As the air-chest fills, a lever attached to it acts upon the regulating tap before mentioned, and lessens the supply of water, so that the piston goes more slowly, but, as the organist requires more wind, and the air-chest falls, the regulating tap is opened, the action of the piston becomes more energetic, and the supply of air keeps pace with the demand, so that the organ is much more evenly blown by the machinery than it can be by men working the bellows.

This is but a brief outline description of the apparatus, for there are several ingenious contrivances about it which have been found requisite to ensure its success in practice, and they do great credit to the mechanical skill of Messrs. Joy and Holt, of Leeds, who have taken a patent for their application of water power to this purpose.

A smaller organ, suitable for a drawing-room, also blown by water pressure applied in the same way, was in use at the Leeds Exhibition of Local Industry during the meeting of the British Association, and a sectional model of the apparatus was placed beside the organ.

I need not enumerate the great advantages of having motive-power always ready to blow an organ, so that the player has merely to turn it on, as it were, by drawing a stop. A lady, an amateur, an invalid, or even a professional organist, may practice or amuse themselves when they please to do so without the help of an organ blower, if the instrument be large, or without blowing by the foot of the performer, as is usual in smaller organs.

Many attempts have been made to apply mechanical power to blow organs, and, in some cases, water-power has been tried. The writer remembers, many years ago, a lady who was an excellent performer, and had a large instrument in her house requiring a man to blow it, until her husband, who was an engineer, had a small water-wheel placed outside of the house, which could at any time be put in action by drawing a stop attached to the sluice, and so turning on the water, when a crank fixed upon the axis of the water-wheel worked the bellows; but, in this case, the action was uniform and constant, unless the performer varied it by regulating the quantity of water with the sluices, whereas in the Leeds organs this regulation is effected by the machine itself, without care or thought on the part of the player, and with such a degree of apparent adaptation to the performance exhibited in the movements of the machine, that it seems to know what to do and when to do it.

I may add that the apparatus is not costly, and that the expense of water is not equal to a labourer's wages, where a pressure of only ten pounds on the square inch can be obtained.

I am, &c.,

JOSEPH GLYNN.

28, Westbourne-park-villas, London, W.,
October 25, 1868.

Proceedings of Institutions.

BANBURY.—The half-yearly meeting of the Mechanics' Institute was held on Wednesday, the 29th Sept., Mr. Brooks in the chair. The reports for the last half-year were read and unanimously adopted. They were of a highly satisfactory and encouraging nature. The general report, read by the secretary, states that a great improvement has taken place in the monetary condition of the Institution, and the committee hope to be able to add very considerably to the library during the coming half-year. Since the last meeting a musical soirée has been held in the town hall, when several gentlemen and ladies gave their gratuitous assistance. On the 23rd of June the annual picnic was held, by the kind permission of G. G. Harcourt, Esq., M.P., in the grounds of Nuneham; and about 400 of the members and their friends availed

themselves of the excursion. In addition to the enjoyment of a very pleasant day, the funds of the Institution were increased by the sum of £10 12s. The following are the lectures arranged for the present season:—Basil Young, "On the Life of George Stephenson;" Lizzy Stuart, "On the Ploughman Poet," a musical entertainment; J. Bennett, F.R.A.S., "On the Watch;" George Dawson, M.A., "On Daniel Defoe;" Mrs. Beattie Inglis, "On the Influence of Woman on Society;" George Grossmith, "On Pickwick;" The Rev. J. J. Brown, "On the Natural History of a Book;" J. Wild, "On Music;" F. Warren, C.E., "On the Education of the Workman and his Work—the result of both." The Committee, with a view to promote the convenience of the entire body of the members, have determined that all the lectures shall be delivered at the town hall, in order that the reading-room and library may remain open for the benefit of those who do not wish to attend the lectures. The lecture on the Life of George Stephenson was not well attended, but Miss Lizzy Stuart's musical entertainment was very successful, and the committee are pleased at being able to state that in consequence no loss has as yet been sustained on the lectures. The committee report the promise of a subscription of £10, by B. Samuelson, Esq., towards the lecture fund. The sum of £10 was awarded to the Institution by the Society of Arts for the success of its candidates at the last Examination; and it has been determined (with the view to promote the education of the members) to devote it towards paying one-half the cost of members of the Institute attending the classes.—Mr. Gibbs moved the adoption of the report, in so doing briefly referring to the satisfactory condition, more especially financially, of the Institution, which, instead of being in debt, would have a balance of £49 7s. 4½d. to its credit, when the various amounts due on account of members' subscriptions, &c., were paid in.—Mr. Boss then read his report as librarian, from which it appears that the present number of members is 204. The following classification of them shows that, to a certain extent, the Institution has the support of all classes:—1 peer; 1 member of parliament; 1 clergyman; 3 magistrates; 6 bankers; 7 professional gentlemen; 9 schoolmasters, mistresses, and teachers; 48 tradesmen; 36 clerks, 41 tradesmen's assistants; 31 mechanics; 20 without any particular calling, youths, &c. The number of books issued from the library during the past half-year is 1,875, making more than 4,000 circulated in the year. There has been a greater demand for books of an elementary and scientific character than is usual, during the last few weeks. 19 new members have already entered the Institution in this, the Michaelmas quarter.—The election of officers then took place, and the proceedings terminated by votes of thanks to the librarian, the secretary, and treasurer, which those gentlemen respectively briefly acknowledged.

LONDON MECHANICS' INSTITUTION.—Lord Murray has written to Mr. T. J. Pearsall, the corresponding secretary, expressing his concern that the parent Mechanics' Institution of England should be in need of extraneous assistance, and enclosing a draft for £100 in aid of a fund for purchasing the lease of the building, and thus extinguishing the heavy annual charge for rent. The total amount to effect this desirable object is £3,500. The subscriptions from private sources amount to about £400, and a public appeal is shortly to be made.

MANCHESTER ATHENÆUM.—A soirée, composed of the members and friends of the Manchester Athenæum, took place on Thursday evening, the 21st October, in the Free Trade-hall, at which more than 2,000 were present. Among the guests present on this occasion were Lord Stanley of Alderley (who presided), Lord J. Russell, the Hon. Judge Haliburton, Professor Aytoun, Sir James Brooke, Mr. Monckton Milnes, M.P., Mr. W. M. Massey, M.P., Mr. James Kershaw, M.P., Mr. William Brown, M.P., Mr. John Cheetham, M.P., Mr. J. P. Brown-Westhead, M.P., Mr. James Grant, of Edinburgh, Mr. G.

Cruikshank, &c. The following gentlemen were upon or near the platform:—Admiral Smyth, Col. Wilbraham, M^r Mahon, Bond, Servante, Hodges, Kennedy; M^r Ivie Mackie, Mayor of Manchester; M^r W. Harvey, Mayor of Salford; Rev. Dr. Petruilas, Alderman Sir Elkanah Armitage, president of the Institution; Sir James Watte, Neild, Watkins, Willert, Clark, Heywood; M^r Thomas Wright, "the prison philanthropist;" William Fairbairn, F.R.S., Thomas Bazley, Oliver Heywood, Samuel Brooks, Malcolm Ross, A. Schwabe, H. P. Rée, John Reid, W. R. Wood, Thomas Clegg, Thomas Barge, jun., James Crossley, Joseph Heron, the Belgian Consul (M^r. Kissel), the Very Rev. the Dean of Manchester, the Hon. and Rev. M^r. Byng, the Rev. M^r. Birch, the Mayor of Ashton, Sir James L. Bardale, M.D., Lieut. Sturt, Messrs. Joseph Adshead, C. J. S. Walker, Capt. Palin, Messrs. J. D. Mackenzie, C. Swallow, W. W. Goulden, R. P. Willcock, Isaac Gregory, and Dr. Hudson, the secretary of the Institution.—The CHAIRMAN said that the Manchester Athenæum was the first association of the kind which recognised the propriety of educating the people by means of attractive literature, by consulting their tastes and interests, and not by cramming philosophy and hard sciences into them; and by providing them with good and useful books, and above all with newspapers. It had long been found necessary by Mechanics' Institutions to speak to men rather through their feelings and tastes than to compel them to be too wise all of a sudden. It had struck him that there was great justice in the remarks of M^r. Sotheron-Estcourt, who, referring to the lamentations of many people upon the difficulty of keeping boys at school until they could obtain complete instruction, said he felt that it was a great evil to compel them to attend school beyond the time for which their circumstances allowed them to stay. M^r. Sotheron-Estcourt stated that he had made a successful experiment with such boys. During the wars in the Crimea and in India he had invited the boys in his parish to meet him, either to hear a short lecture, or to listen to the reading from a newspaper, by one of their own number, of an account of the proceedings at the seat of war. By that means he induced them voluntarily to continue their studies; and by degrees they expressed a greater anxiety to instruct themselves. The chairman then made some general remarks on the advantages of education and of the spread of cheap literature, and concluded by introducing Lord John Russell to the meeting.—Lord JOHN RUSSELL, after expressing his surprise that some attacks had been made upon him in a local newspaper of large circulation, for having accepted the invitation to be present on this occasion, said that one of the principal benefits derived from such meetings as the present was, that persons from different parts of the country, and persons engaged in different situations in life—some political, some literary, some industrial—were induced to meet together and to express good-will and fellowship towards each other. We had in this country a great deal of attachment to our private life. We boasted of our affection for our homes very justly, but we had not the public life which was common in some ancient republics, nor that sort of public life which he understood now existed in some of the United States of America. And the more we were attached to private life, the more necessary it appeared that we should now and then mingle together and exchange good wishes. In considering the purposes of the Institution which they came there to support, he found, in the first place, that newspapers were read, next that books are taken out very largely from the library and perused by the members. With regard to newspapers, it was quite obvious that there must always be a great interest attached to the matter contained in them, and, with regard to the library, he found that, of about 28,000 books taken out to read, there were above 17,000, or near 18,000 of novels, and about 10,000 of works of history and of all other descriptions. He thought this was a very creditable account.

So far from being shocked at the quantity of novels that were read, he really did not wonder that men who had occupations that gave them a great deal of care and anxiety should resort to those delightful fictions which went by the name of novels, and that they should seek in those pages relaxation after their harassing employments. So, looking at another institution, the free library of that town, there were about 40,000 novels to about 23,000 books of other descriptions—a somewhat similar proportion, and one which he thought did great credit to the readers, because it showed that there was a very fair proportion—upwards of one third—who did read books of an informing and instructive kind. What then would be the effect of all this increase of knowledge and instruction? He could not but believe that it would make the persons who possessed it happier, and the institutions of the country safer than they were before. If a man could abstract his attention, for a portion of the day, from the care and anxieties of his ordinary occupation, and could look into the past, or be interested in some tale, or, still more, be raised by the sublime songs of our poets, much he thought was gained for the elevation of his moral nature and the happiness of his daily existence. It was characteristic of the political institutions of this country, that while the fullest protection was given to life and property, there was at the same time the greatest liberty of opinion—the utmost power given to every one to express his opinions—to form any opinion that he chose, and to express that which he thought. If that was the case, it gave an additional importance to all these societies for literature, for education, and for improvement; because it gave to every man the means, if he had the wish and the ambition, and the talent, of rising in the society to which he belonged. If such was the spirit of our institutions, it was of great importance not only to us but to the world in general, that we should hold on steadily in our course. We had, as had been said long ago, "a precedence in teaching the nations how to live." That precedence was not to be maintained by any carelessness, by any ignorance, or by any precipitation, but by the people of this country being thoroughly and well informed, weighing what they are about to do, taking counsel from the lessons of others, and examining their laws with a critical, but not with a prejudiced or unfriendly eye. Believing in the high character of this people, in their natural good sense, he delighted in every occasion in which he saw that the knowledge of the people of this country, and with their knowledge their power, was making advance. After referring to the statue of M^r. Joseph Brotherton, M.P., and the great private and public usefulness of that gentleman, as a proof of the kind of man whom Manchester loved to honour, his lordship concluded by saying that he believed increase of knowledge would bring with it increase of veneration; and that the more we knew, the more we should bow to the wonderful works of Almighty wisdom.—Professor ARRON, after some introductory remarks, said he had lately arrived at the conclusion that while people elsewhere had been talking vaguely, and, in some cases, foolishly, upon the subject of education, Manchester had been quietly doing everything. He believed the Free Library in Manchester to be unequalled in the world; and he found that, having been in operation for a considerable period, it now furnished precisely the data which statesmen and philanthropists had been for a long time attempting to find out—namely, what was the kind of reading that ought to be given to the people. Why, of course, the kind of reading to be given to the people was that kind which the people would accept. He found that the standard works of imagination were those most in favour with the people, and he thought it a great mistake to expect that all working men should be made scientific philosophers. Let the people be only taught to read; give them the power of understanding; give them libraries, as Manchester had done, and they would have given

to the mechanic the basis of his own education, and have placed it within his power. He was extremely glad to see, from the report, that the evening classes had been cultivated to a great extent—classes in French, German, chemistry, and several other branches of popular learning—attended by young men who only had leisure during the evening. But he was disappointed that the system of lectures had been discontinued in the Athenæum. He knew that many objected to them as superficial things, on the ground that those who attended three or four lectures could merely acquire a smattering of a subject. That was undoubtedly true at present. But the great thing was to get men who could well handle their subjects, and who should select such subjects as would be of real interest to the community, and yet not too deep or too affected. Professor Aytoun concluded by advocating oral teaching, and especially the reading aloud to large audiences of great works of imagination. The meeting was then addressed by the Hon. Judge HALIBURTON, Sir JAMES BROOKE, K.C.B., Mr. MONCKTON MILNES, M.P., and Mr. GEORGE CRUIKSHANK. On the motion of Mr. J. CHEETHAM, M.P., seconded by Mr. J. P. BROWN-WESTHEAD, M.P., a vote of thanks was passed to Lord John Russell for his attendance and address; and a similar compliment was paid to the chairman for presiding, on the motion of Mr. JAMES CROSSLEY, seconded by Mr. MALCOLM ROSS. The proceedings then terminated.

MEETINGS FOR THE ENSUING WEEK.

- Mon.**British Architects, 8. Mr. W. Tite, "Observations on the recent discoveries of the remains of the Mausoleum at Halicarnassus."
Wed.Geological, 8. I. Rev. O. Fisher, "On some natural Pits in the Tertiary Lands of Dorsetshire." II. Dr. R. Budge, "On some points in the Geology of South Africa." III. Mr. W. Stow, "On some Fossils from South Africa." IV. Mr. N. T. Wetherell, "On some of the Siliceous Nodules of the Chalk."
Thurs.Linnæan, 8. Mr. George Bentham, "Notes on British Botany."
 Zoological, 3.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Oct. 22, 1858.]

Dated 30th June, 1858.

1472. B. Nicoll, 47, Regent-circle—Imp. in circular knives and saws.

Dated 16th August, 1858.

1870. P. Riehard, 17, Rue St. Jean, Faubourg St. Germain, Paris—Imp. in apparatus for obtaining motive power.

Dated 26th August, 1858.

1928. J. Dredge, Walcot, Bath—Imp. in condensers for steam engines, and in pumps for working such condensers, or for lifting water from deep mines, and for any other use to which pumps are applicable.

Dated 26th August, 1858.

1936. G. M. Sautter, 14, Boulevard Montmartre, Paris—Imp. in telegraphs. (A com.)

Dated 10th September, 1858.

2050. J. L. Chester, Philadelphia, U.S.—Imp. in self-priming apparatus for fire-arms, and in the preparation of percussion primers to be used therewith. (Partly a com.)

2064. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in Jacquard machines. (A com.)

Dated 11th September, 1858.

2062. W. Baker, Kingston-upon-Hull—Imp. in preparing food.
 2064. J. M. Courtauld, Braintree, Essex—An imp. in clearing and preparing silk crapes, aerophanes and other like fabrics, laces and other gauzes and lace, and in machinery employed therein.

Dated 13th September, 1858.

2076. R. Frost, Steam Mills, and A. Rigg, Park gate-road, Chester—Imp. in apparatus for cleaning grain or seeds and bran.

Dated 14th September, 1858.

2084. W. J. Hoyle, Huddersfield, and K. Howson, Lancaster—Imp. in arrangements and mechanism, or apparatus for signalling by sound.

Dated 18th September, 1858.

2104. G. Ostermoor, 37, Basinghall-street—Ornamenting boats, victorines, and muffs.

Dated 20th September, 1858.

2112. J. L. Chester, Philadelphia, U.S.—An improved cartridge opener and ramrod fastener. (Partly a com.)

Dated 24th September, 1858.

2144. E. T. Wright, Wolverhampton—A new or improved method of, and apparatus for, preventing the explosion of or injury to steam boilers through deficiency of water.

Dated 25th September, 1858.

5152. A. F. Delacroix, Chartres, France—Imp. in locomotive engines.
 2156. C. Hall, Navesstock, Essex—Imp. in apparatus for applying power to the cultivation of the soil.

2158. J. C. Dieulafoy, 2, Rue Sainte Apolline, Paris—A kind of garment which may receive different forms according to the will of the wearer.

Dated 28th September, 1858.

2164. E. Lewthwaite, Halifax, and G. Ambler, Queen's Head, near Halifax—Imp. in clocks, watches, chronometers, and other timepieces.

2166. J. H. Lineay, 4, Grocers' Hall-court—Certain imp. in binding or covering books.

2168. J. L. Clark, Adelaide-road, Haverstock-hill—Imp. in coiling and securing telegraph cables preparatory to laying them from ships or vessels.

Dated 29th September, 1858.

2170. J. Luis, 12, Welbeck-street, Cavendish-square—A new method of fixing pastel pictures. (A com.)

Dated 30th September, 1858.

2174. J. Wright, Birmingham—Certain imp. in the mode of arranging and moving fire-bars for locomotive, puddling, and other furnaces.

2176. S. Taylor, Rochdale, Lancashire—Certain imp. in apparatus to be used as a fire-escape, which improvements are also applicable to other similar purposes.

2178. H. Kinsey, W. H. Morrison, and S. Smithard, Nottingham—Imp. in means or apparatus for the purpose of folding lace or other fabric, and also for cutting the same into lengths adapted to be used in the manufacture of bonnet and cap fronts, and for other purposes of millinery.

2180. C. W. Siemens, John-street, Adelphi—Imp. in electric telegraphs. (Partly a com.)

2182. G. Uhlhorn, Grevenbroich, near Cologne, Prussia—Imp. in applying motive power to give motion to machinery.

2184. F. J. Money, Thaxted, Essex—Imp. in the construction and adaptation of sewers.

Dated 1st October, 1858.

5185. W. Blake, 16, Harley street—An improved portable fire-escape.

2186. J. T. F. Newbon and T. Smith, 62, Fenchurch-street, and J. Brown, 37, Tollit-street, Mile End—An improved method of lifting and lowering ships' anchors.

2187. M. Hipp, Bern, Switzerland—Imp. in electric telegraphs.

2188. J. W. Wilkins, Temple-chambers, Fleet-street, and J. B. Dunn, Great Winchester-street—Imp. in constructing electric telegraph cables.

2189. Sir E. Heisch, 40, Charing-cross—Imp. in the manufacture of telegraphic cables.

2191. H. Bradbury, Whitefriars—Imp. in producing printing surfaces from engraved plates.

Dated 2nd October, 1858.

2192. J. Rogers, 9, Queen-square, Bartholomew-close—Imp. in submarine electric telegraph cables.

2193. L. D. Owen, 192, Tottenham-court-road—Imp. in ploughs for digging up potatoes, and for other purposes. (A com.)

2194. W. Brierley, senr., Cleckheaton, Yorkshire—Imp. in looms for weaving carpets and other fabrics.

2196. H. Mosler, 2, Francis-street, Golden-square—A new gas burner.

2196. B. Samuelson, Banbury—Imp. in the wheels of carts and other carriages to be used on common roads.

2197. H. G. Collins, Paternoster-row—Imp. in the production of blocks or surfaces to be used in printing.

2198. J. C. Holman, London-street, and E. W. Holman, Grafton-street, Fitzroy square—An improved pianoforte action.

2199. A. V. Newton, 66, Chancery-lane—An improved governor for marine and other steam engines. (A com.)

2200. B. Stimpson, Lower-road, Islington—An improved construction of fogot or fire lighter.

Dated 4th October, 1858.

2201. R. Dolby and J. Gates, Liverpool—An improved process of transfer printing, and ornamenting on glass and other transparent substances.

2202. L. A. Normandy, jun., 67, Judd street—An improved apparatus for the prevention of boilers exploding from a deficiency of water. (A com.)

2203. L. A. Normandy, jun., 67, Judd street—Imp. in the manufacture of sulphate of copper. (A com.)

2204. M. Van Poteghem, Ghent, Belgium—Imp. in looms for weaving figured fabrics. (A com.)

2206. F. Trevithick, Penzance, Cornwall—Imp. in applying sails and keels to boats and vessels.

Dated 5th October, 1858.

2206. J. Mills, Manchester—Certain imp. in machinery or apparatus for roving, spinning, or spinning cotton and other fibrous materials.

2207. A. Bessemer, Upper Holloway—Imp. in the manufacture of iron and steel, and in apparatuses to be employed therein.

2208. Major C. E. Oldershaw, R.A., Aldershot—An improved method of constructing electric telegraph cables.

2209. W. Menelaus, Dowlais Iron Works, Glamorganshire—Imp. in machinery for straightening rails and wrought-iron bars.
 2210. M. Henry, 84, Fleet-street—Imp. in the means of, or arrangements for, working steam expansively. (A com.)
 2211. J. H. Brown, Abbey Mills, Romsey, Hants—Imp. in the manufacture of projectiles.
 2212. G. Hamilton, St. Martin's-le Grand, and W. Nash, Poplar—Imp. in locks.
 2213. J. H. Brown, Abbey Mills, Romsey, Hants—Imp. in the manufacture of cartridges.
 2214. J. Milnes, Sutton Mill, Cross Hills, near Leeds, Yorkshire—Imp. in weaving fabrics where cross weaving is employed.
 2215. G. Lovett, East street, Manchester-square—Imp. in portable apparatus for administering hot air, vapour, and shower baths.
 2216. M. Jacoby and F. R. Ensor, Nottingham—Imp. in the manufacture of bobbin-net or twist lace, and other fabrics made in twist lace machines.

Dated 6th October, 1858.

2217. J. Luis, 1b, Welbeck-street, Cavendish-square—A new method of joining sheet-iron, cast-iron, gutta-percha, and other tubes, by means of muffles. (A com.)
 2218. G. Heppell, Newcastle-on-Tyne—Imp. in the construction of boilers, furnaces, and flues.
 2219. G. Collier, Halifax—Imp. in winding machines.
 2220. M. Harnett, Moreton-street, Mimico—Imp. in preventing incrustation in steam-boilers. (A com.)
 2221. C. Hill, Great Western Railway, Chippenham Station—Imp. in omnibuses and in apparatus for upholding the windows of omnibuses and other carriages.
 2222. J. Ridsdale, Stoke Newington—An improved reservoir or fountain pen.
 2223. W. Malm, Clapham-road, Surrey—Imp. in apparatuses for the manufacture of gas.
 2224. D. Scattergood and R. W. Smith, Nottingham—Imp. in machinery for the manufacture of looped fabrics.
 2225. C. Baylis, Poultry, London—An improved mode of constructing and arranging underground chambers in populous cities or towns, for the reception of gas and water pipes, and telegraph wires.

Dated 7th October, 1858.

2226. D. Nicoll, 114, Regent-street—Imp. in the manufacture of cloaks and other garments, and for their application to purposes to which they have not hitherto been applied.
 2227. C. H. Thurnham, Dalston—Imp. in the construction and application of certain mechanical arrangements to be adapted to the wheels of locomotives, carriages, and other vehicles for facilitating their traction or draught.
 2228. E. J. Seyd, and J. W. N. Brewer, City of London—An imp. in the preparation of paper to render writing thereon indelible.
 2229. J. C. Nouveau, 2, Rue Sainte-Appoline, Paris—Imp. in stopping or stoppering bottles and other vessels containing non-gaseous liquids.
 2230. D. Naylor, Stockport—Imp. in looms for weaving carpets and other fabrics, and in the methods of manufacturing the same.
 2231. N. Fellows, jun., West Derby, Lancashire—Imp. in tea kettles and other like domestic vessels.
 2232. F. Ransome, Ipswich—Imp. in preserving wood.
 2233. E. R. Handcock, 57, Pall-mall, Westminster—Certain imp. in machinery applicable to engines to be worked by steam and other motive power.

Dated 8th October, 1858.

2234. J. Luis, 1b, Welbeck-street, Cavendish-square—A new cutting and stamping press. (A com.)
 2235. J. Letch, Margaret-street, Cavendish-square—An improved method of constructing fire-arms.
 2237. T. Waller, Rose lane, Ratcliff—Imp. in stoves and fire places for the prevention of smoke and the better ventilation of apartments.
 2238. J. Mitchell, H. Mitchell, and T. England, Bradford—Imp. in means, machinery, or apparatus employed in spinning wool, mohair, alpaca, silk, and other fibrous substances.
 2239. R. Searle, Woodford Wells, Essex—Imp. in insulating and preserving and laying submarine and other telegraphic wires or cables.
 2240. A. Nicholls, Manchester, and T. Walker, Birmingham—An improved spring-hook, catch, or fastening.
 2241. W. A. Munn, Throley-house, near Faversham, Kent—Imp. in horse-hoos.
 2242. T. Roberts and J. Dale, Manchester—An improved process for obtaining salts of soda and other alkalis.
 2243. C. W. Lancaster, New Bond-street—A metal or metallic alloy especially adapted to the manufacture of fire arms and ordnance.
 2244. A. Felton, 184, Brick-lane, Spitalfields—Imp. in instruments used for inserting and fixing metal eyelets.
 2245. J. T. Smith, Gray's Inn—Imp. in electric cables.
 2246. E. Birchley, Upper Severn-terrace, Worcester—An improved construction of cartridge.
 2247. F. W. Gerhard, Tlohbome-street, Haymarket—Imp. in the manufacture of aluminium and sodium.

Dated 9th October, 1858.

2248. A. E. Galliard, 2, Seymour-place, St. James Churchyard, Clerkenwell—Making self-supplying portable fountains to play water or water perfumed.

2250. J. Tatlock, Hookersbrook, near Chester—Imp. in electric telegraphs, and in telegraphic cables or conductors for the conducting of electricity in submarine and underground telegraphs.
 2251. L. Hope, Bishopsgate Churchyard—Imp. in electric telegraphic cables. (A com.)
 2252. W. Crofts, Lenton-terrace, Park Side, Nottingham—Imp. in the manufacture of fabrics by bobbin net or twist-lace machinery.
 2253. J. B. Pascoe and J. R. Thomas, Chacewater, Cornwall—Imp. in condensing and gassing smoke, which are applicable also to forcing and drawing water, propelling ships, and drawing and forcing air to be worked with animal, water, steam, or air power.
 2254. J. Scrimshaw, 13, Johnson-street, Sheffield—Imp. in pumps.

Dated 11th October, 1858.

2255. A. Miller, Glasgow—Imp. in locomotive steam engines. (A com.)
 2256. J. Holroyd, Leeds—An imp. in the knives used for shearing woollen cloths, and cloths made of wool and other material.
 2257. C. F. Vassero, 45, Essex-street, Strand—Imp. in constructing reflectors. (A com.)
 2259. J. Beattie, Lawn-place, South Lambeth—Imp. in locomotive and other steam engines.
 2261. J. L. Hancock and F. L. Hancock, Pentonville—Imp. in implements for tilling, breaking up, or pulverising land, for sowing seeds, and for thinning out turnips and other crops.
 2262. J. England, Charles-street, Fitzroy-square—Imp. in apparatus for cleaning the plates used in photography.
 2263. J. Platt, Audlem, Chester—Imp. in locks.
 2264. J. Nicholson, junr., Meadow-street Works, Sheffield—Imp. in machinery for cutting and winding strips or shreds of steel, silver, or other metal used for ladies' dresses, measuring tapes, and other purposes, in which the use of strips or shreds of metal are required.
 2266. T. Riddell, Carocro-terrace, Old Ford, Bow—An improved arrangement for sustaining window shades and sliding panels.
 2267. M. Stow, Leeds—Preventing or securing the detection of alterations or pressures in bankers' cheques and other similar instruments, and the crossings thereof.
 2268. W. E. Newton, 66, Chancery-lane—Improved apparatus for facilitating submarine explorations. (A com.)
 2272. W. Johnston and W. Ross, Glasgow—Imp. in water-closets and taps or valves.
 2274. Capt. G. Beadon, R.N. Bathpool, Somerset—Imp. in the construction of ships, boats, rafts, and vessels for passing through water, or through the atmosphere, or partly through the water and partly through the atmosphere.
 2276. H. W. Cuthbertson and G. Cuthbertson, Dundas-street, Monkwearmouth, Sunderland—Imp. in lever purchases for ship, windlasses, pumps, and other similar purposes.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Oct. 26, 1858.]

- | | |
|---------------------------------|---|
| October 26th. | 1002. D. E. Hughes. |
| 917. W. Jones. | 1023. J. M. Duward. |
| 920. J. Seaman. | 1044. J. M. E. Mason. |
| 921. W. Foster. | 1050. G. H. Creswell. |
| 922. E. E. Leo. | 1101. H. Curzon, jun. |
| 928. C. F. Vassero. | 1150. J. C. Brant. |
| 932. B. Drukker. | 1169. G. Alton and J. Fernie. |
| 938. D. E. Hughes. | 1199. J. Schofield and G. Harl. |
| 943. B. Martin and C. J. Light. | 1296. A. Rigg, sen., and A. R. Rigg, jun. |
| 949. A. Winkler. | 1547. J. Broadley. |
| 964. A. M. Perkins. | 1632. J. Chadwick. |
| 955. C. Lawrence. | 1816. W. Spence. |
| 957. W. Smith. | 1834. G. Houghton. |
| 958. W. Smith. | 1861. C. O'Neill. |
| 968. G. H. Ellis. | 1898. W. Clay and E. L. Benson. |
| 975. R. Wardall. | 1906. C. De Jongh. |
| 981. J. A. Hartmann. | 1914. A. Boyle. |
| 985. J. Taylor. | |
| 995. W. Ross. | |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[From Gazette, Oct. 23, 1858.]

- | | |
|---------------------|----------------------------------|
| October 18th. | October 19th. |
| 2342. W. Tatham. | 2363. N. S. Dodge. |
| 2343. W. A. Gilbee. | 2377. J. Blyss. |
| 2372. W. Shears. | October 26th. |
| 2414. W. Hartley. | 2392. T. H. Sharp & R. Furnival. |
| | 2484. T. Thomas. |

[From Gazette, Oct. 26, 1858.]

- | | |
|-------------------|---------------------|
| October 21st. | October 23rd. |
| 2375. J. Smith. | 2365. E. H. Rascol. |
| October 22nd. | 2404. J. Hanks. |
| 2399. S. O'Regan. | 2416. J. Whitworth. |

Journal of the Society of Arts.

FRIDAY, NOVEMBER 5, 1858.

NOTICE TO MEMBERS.

The One-Hundred-and-Fifth Session of the Society will commence on Wednesday, the 17th inst. The Chair will be taken at 8 o'clock on the following Wednesday Evenings:—

1858. November.....	—	—	17	24	—
.. December	1	8	15	22	—
1859. January.....	—	—	19	26	—
.. February.....	2	9	16	23	—
.. March	2	9	16	23	30
.. April	6	13	—	27	—
.. May.....	4	11	18	25	—
.. June.....	—	—	—	—	29*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 17.—Introductory Address on the Opening of the One-Hundred-and-Fifth Session, by the Chairman of the Council, Mr. C. WENTWORTH DILKE.

* * On this evening the Medals which were awarded by the Council for Papers read at the Weekly Evening Meetings during the last Session, and for articles submitted to the Society's Committees, will be distributed.

November 24.—Mr. F. JOUBERT. "On a Method of rendering Engraved Copper-Plates capable of Producing a greatly-increased Number of Impressions."

December 1.—Mr. HYDE CLARKE. "On Copper-Smelting."

December 8.—Mr. P. A. HALKETT. "On Guideway Agriculture; being a System enabling all the Operations of the Farm to be performed by Steam Power."

December 15.—Mr. E. J. REED. "On the Modifications which the Ships of the Royal Navy have undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Powers of Attack and Defence."

December 22.—Dr. FORBES WATSON. "On the Growth of Cotton in India."

LITERARY AND ARTISTIC COPYRIGHT.

Formerly Belgians enjoyed the unenviable notoriety of being amongst the greatest freebooters of whom alien authors and artists had to complain. The piracy of foreign literary and artistic productions was then considered to be a perfectly legitimate branch of Belgian industry on the part of those who were interested in holding so manifest an injustice. Happily the good sense and honesty of the Belgian nation at length prevailed, and in 1852 the Government commenced the annihilation of a state of things so disgraceful to the country, by entering into international treaties with foreign States for the mutual protection of Copyright works.

The Annual General Meeting: the Chair will be taken at 8 o'clock. No Visitors are admitted to this Meeting.

This noble reform so recently, yet happily commenced, has been further promoted by M. CHARLES FAIDER, formerly Minister of Justice, and a most distinguished advocate, together with a number of other Belgian gentlemen of high position and influence. These parties, actuated by motives which do them eternal honour, proposed and succeeded in forming a Congress at Brussels of distinguished men of all countries interested in the production of original literary and artistic works. A programme* of the subjects for discussion was issued, and persons and societies connected with Literature and Art were invited to assist at the meeting of the Congress if possible, and, if not, to state their views by letter to the secretary upon the subjects proposed for discussion.

The Congress was opened on the 27th September, under the presidency of M. Charles Faider. Upwards of 500 letters were received from private individuals and societies, expressing their approval of the objects of the Congress. About 250 persons attended at the meeting of the Congress, and took part in the proceedings. Germany, England, Belgium, Denmark, Spain, the United States, France, Italy, the Low Countries, Portugal, Russia, Sweden and Norway, and Switzerland, were all represented.

The members of the Congress were then divided into five committees, for the purpose of considering and debating the several subjects for their decision. All these committees, except the second, terminated their deliberations on the 27th Sept. Those of the second committee extended over all the four days during which the Congress continued, that is, to the 30th.

Each committee having made its report to the general meeting of the Congress, such reports were then read and discussed.

His Majesty the King of the Belgians and the Royal Princes took great interest in the objects of the Congress, honouring the meetings with their presence during the debates, and subsequently receiving the members at the palace. The following are the

"RESOLUTIONS PASSED BY THE CONGRESS.

I. Questions relating to an international recognition of Literary and Artistic Property.

1. The Congress considers that the principle of an international recognition of property in works of literature and art, in favour of their authors, ought to take a place in the legislation of all civilised nations.

2. This principle ought to be admitted from country to country, even in the absence of reciprocity.

3. Foreign authors ought to be placed upon exactly the same footing as native authors.

4. There is no reason for requiring foreign authors to conform to particular formalities in order to be qualified to claim the right of property. In order to obtain that right, it ought to be sufficient that they should have complied with the formalities required by the law of the country where the original publication first appeared.

5. It is desirable that all countries should adopt, for property in works of literature and art, a legislation resting upon a uniform basis.

II. Questions relating to property in works of Literature and Art in general.

1. Authors of works of literature and art ought to enjoy, during their whole life, the exclusive right of publishing and reproducing their works, of selling them, of causing them to be sold or distributing them, and of giving up altogether or partially their property in them, or their right of reproduction.

The survivor of husband and wife† ought to retain

* See present Volume of the Journal, p. 578.

† By the law of France the wife of an author, in the event of her surviving her husband, is entitled to the Copyright in his works during her life.—Ed. J. S. A.

the same rights equally for life, and the personal representatives of, or other the persons entitled through the author, ought to enjoy them for fifty years, commencing either from the death of the author, or from the cessation of the widow's rights as the case may be.

2. In the applicability of these rights, there is no ground for drawing any distinction between different categories of works of literature and art, literary or musical compositions, or productions of arts of design.

There is no distinction to make between works appearing under a false name, and works published under the true name of the author.

Neither should the duration of rights be made to depend upon the condition of the persons entitled, whether children, personal representatives, or assignees.

3. The right of the first editor over an anonymous work ought to endure for 30 years, commencing from publication.

If the author makes himself known before the expiration of the term fixed by law, he ought to have the same rights which would have belonged to him if the work had originally appeared under his name.

4. With reference to posthumous works, if the rights of the author's widow, and of his personal representatives, or the persons entitled are not extinguished, the posthumous work ought to belong to them during a period equal to that which is allowed them by law.

If these rights are extinguished, the owner of a posthumous work ought to have an exclusive right to endure for 30 years, commencing from publication.

5. The exclusive right of the author should be guaranteed for publishing public lectures, sermons, and other discourses delivered in public, which cannot be published separately nor in the body of a work without the consent of the authors or of their representatives. With regard to addresses by advocates in Courts of Law, and speeches made in political assemblies, this consent ought only to be necessary for their publication in a collection of the speaker's works.

6. The right of the author over the reproduction of his original work, ought to carry with it the right of translation, subject to the following restriction:—The author should have for ten years, commencing from publication of the translation, the exclusive right of translating, or causing to be translated, his work into all languages, on condition of exercising this right before the expiration of the third year from the publication of the original work. If, at the expiration of the third year, the author has not availed himself of this right, everybody should have the power of exercising it concurrently, except in the country where the work originally appeared. After the expiration of the 10 years, although the author may have availed himself of his right, everybody should have the power of translating the original work, and of selling it in all countries except in that where it originally appeared.

7. There is no reason for subjecting authors of works of literature or of art to certain formalities according to their right. If some particular formalities may be of use, whether as a measure of administration and of regularity, or whether as a means of establishing and proving the right of property; if it is expedient to ensure the observance of these formalities by any sort of sanction, their non-observance cannot and ought not to involve a forfeiture of the right. It is important to render these formalities as simple as possible. *Registration*, and the depositing of one or more copies of the work in the hands of a public functionary appointed for that purpose, seem to be the most advantageous method.

III. Questions relating to the Representation and Execution of Dramatic and Musical Works.

1. The right of representation of dramatic or musical works ought to be independent of the exclusive right of reproduction.

2. There is no reason for drawing any distinction be-

tween the two rights with regard to the duration of their enjoyment.

3. The right of property in musical compositions ought to be a barrier to the execution in public of every part of the musical work, without the consent of the composer, whatever the importance of the work may be, and whatever the mode of execution. But, where no pecuniary advantage is joined with interest in Art, the composer's right ought not to be asserted for the purpose of throwing impediments in the way of concerts, whether private or public.

4. The right of property in musical compositions ought to include the right of composing arrangements founded upon the subjects (*motifs*) of the original work.

IV. Questions relating to Works of Design.

1. The author of a drawing, a picture, a work of sculpture, or architecture, or of any other artistic work, ought to have the right of reproducing it, or of authorising its reproduction, by a similar or distinct method in art, and upon either an analogous or a different scale.

2. The unauthorised reproducer ought to be liable to the penalties of piracy when there is usurpation of name, without prejudice to the penalties incurred by a forger, if the piracy amounts to an imitation of signature.

3. The right of property in original designs ought also to embrace the applications which may be made of those designs for industrial purposes.

4. Particular formalities ought not to be required for Works of Art any more than for literary productions as an absolute condition for acquiring and preserving property in them. Nevertheless, as in one case so in the other, some formalities may be desirable, as a measure of regularity, and for facilitating the proper exercise of the right. The works might be *registered*, and the certificate of registration, which would be delivered to the artist, would permit him to prove the authenticity of the work, whether it be in his own possession or in that of his grantees, and, if it should so happen, the authenticity of copies also.

V. Questions upon the Economy of the Subject.

The Congress desires:—

1. The abolition of duties on books and Works of Art, or, at least, the reduction of those duties to the moderate rate, and their simplification so far as the law establishes different duties by category for literary productions.

2. The power of re-entry free of duty for works sent abroad on commission and not sold.

3. The diminution of the postal taxes to the utmost possible extent on all the routes, and the increase of facilities for the despatch and circulation of prints, works, of engravings, and other articles capable of being despatched by post.

4. The assimilation of proofs with corrections to the final impressions, in the countries where the regulations establish a difference.

5. The suppression of all the formalities which obstruct the book-trade."

These resolutions, emanating as they do from the distinguished body of men of all nations who passed the form a new era in the history of legislation about property in original works of literature and of art. However any one acquainted with the subject will differ from the Congress upon some of the minor points included in the resolutions, it is surely impossible for one to differ from those involving the great point of international protection for copyright works.

Authors of literary and artistic productions are deeply indebted to the Congress for their important labours, and authors will best repay that debt by exerting themselves to the utmost to promote and carry out the reforms suggested by the Congress.

BRITISH ASSOCIATION, LEEDS, 1858.

ON THE MEASUREMENT OF WATER BY WEIR BOARDS.

The following report, by JAMES THOMSON, A.M., C.E., Professor of Civil Engineering, Queen's College, Belfast, on the progress of experiments on this subject, was read before the Mechanical Section:—

The experiments proposed to be comprehended in the investigations to which the present interim report of progress relates, have for their object to determine the suitableness of triangular (or V-shaped) notches in vertical plates for the gauging of running water, instead of the rectangular notches in ordinary use. The ordinary rectangular notches, accurately experimented on as they have been, at great cost and with high scientific skill in various countries, with the view of determining the necessary formulas and coefficients for their application in practice, are, for many purposes, suitable and convenient. They are, however, but ill adapted for the measurement of very variable quantities of water, such as commonly occur to the engineer to be gauged in rivers and streams. If the rectangular notch is to be made wide enough to allow the water to pass in flood times, it must be so wide that for long periods, in moderately dry weather, the water flows so shallow over its crest, that its indications cannot be relied on. To remove in some degree this objection, gauges for rivers or streams are sometimes formed, in the best engineering practice, with a small rectangular notch cut down below the general level of the crest of a large rectangular notch. If, now, instead of one depression being made, for dry weather use, in a crest wide enough for use in floods, we conceive of a large number of depressions, extending so as to give to the crest the appearance of a set of steps or stairs, and if we conceive the number of such steps to become infinitely great, we are led at once to the conception of the triangular instead of the rectangular notch. The principle of the triangular notch being thus arrived at, it becomes evident that there is no necessity for having one side of the notch vertical, and the other slanting; but that, as may, in many cases, prove more convenient, both sides may be made slanting, and their slopes may be alike. It is then to be observed that, by the use of the triangular notch, with proper formulas and coefficients, derivable by due union of theory and experiments, quantities of running water from the smallest to the greatest, may be accurately gauged by their flow through the same notch. The reason of this is obvious from considering that, in the triangular notch, when the quantity flowing is very small, the flow is confined to a small space admitting of accurate measurement; and that the space for the flow of the water increases as the quantity to be measured increases, but still continues such as to admit of accurate measurement.

Farther, the ordinary rectangular notch, when applied to the gauging of rivers, is subject to a serious objection from the difficulty or impossibility of properly taking into account the influence of the bottom of the river on the flow of the water to the notch. If it were practicable to dam up the river so deep that the water would flow through the notch as if coming from a reservoir of still water, the difficulty would not arise. This, however, is seldom to be done in practice; and, although the bottom of the river may be so far below the crest as to produce but little effect on the flow of the water when the quantity flowing is small, yet when the quantity becomes great, the "velocity of approach" comes to have a very material influence on the flow of the water, but an influence which it is usually difficult, if not impracticable, to ascertain with satisfactory accuracy. In the notches now proposed, of triangular form, the influence of the bottom may be rendered definite, and such as to affect alike (or, at least, by some law that may be readily determined by experiment) the flow of the water when very small, or when very great, in the same notch. The method by

which I propose that this may be effected, consists in carrying out a floor, starting exactly from the vertex of the notch, and extending both upstream and laterally, so as to form a bottom to the channel of approach, which will both be smooth and will serve as the lower bounding surface of a passage of approach, unchanging in form, while increasing in magnitude at the places, at least, which are adjacent to the vertex of the notch. The floor may either be perfectly level, or may consist of two planes, whose intersection would start from the vertex of the notch, and, as seen in plan, would pass up stream perpendicularly to the direction of the weir board; the two planes slanting upwards from their intersection more gently than the sides of the notch. The level floor, although theoretically not quite so perfect as the floor of two planes, would probably, for most practical purposes, prove the more convenient arrangement.

With reference to the use of the floor, it may be said, in short, that by a due arrangement of the notch and the floor, a discharge orifice and channel of approach may be produced, of which (the upper surface of the water being considered as the top of the channel and orifice,) the form will be unchanged, or but little changed with variations of the quantity flowing; very much less, certainly, than is the case with rectangular notches. The laws regulating the quantities of water flowing in such orifices as have now been described, come naturally next to be considered. Without, however, in the present interim report, attempting to enter on a detailed discussion of theoretical considerations on this subject, I shall here merely advert briefly to the principal results and methods of reasoning.

By theory I have been led to anticipate that the quantity flowing in a given notch should be proportional, or very nearly so, to the $\frac{3}{2}$ power of the lineal dimensions of the cross section of the issuing jet, or to the $\frac{3}{2}$ power of the head of water over the vertex of the notch. This head is to be understood, in the case of water flowing from a still reservoir, as being measured vertically from the level water surface in the reservoir, down to the vertex of the notch; or in the case of water flowing to the notch with a considerable velocity of approach over a floor arranged as above described, the head is to be considered as measured vertically from the water surface, where the motion is nearly stopped by the weir board at a place near the board, but as far as may be found practicable, from the centre of the notch. The law here enunciated, to the effect that the quantity flowing should be proportional to the $\frac{3}{2}$ power of the head, I consider should hold good rigidly in reference to water flowing by a triangular notch in a thin vertical plate, from a large and deep reservoir of still water, if the water were a perfect fluid, free from viscosity and friction, and from capillary attraction at its surface, and from any other slight disturbing causes that may have minute influences on the flow, the flow being supposed to be that due simply to gravitation resisted by the inertia of the fluid. The like may be said of water flowing from triangular notches with shallow channels of approach, having floors as described above, when due attention is given to make the passages of approach so as really to remain unchanged in form for a sufficient distance from the notch, while increasing in magnitude as the flow increases (such being supposed according to my theory to be possible), and if due attention be paid to the measuring the heads in all cases in positions similarly situated with reference to the varying dimensions of the issuing streams.

In illustration of these statements, or suppositions, I would merely say, that, if two triangular notches, similar in form, have water flowing in them at different depths, but with similar passages of approach, the cross-section of the two jets at the notches may be similarly divided into the same number of elements of area; and that the areas of the corresponding elements will be proportional to the squares of the lineal dimensions of the

cross sections; or, as from various considerations, may readily be assumed, proportional to the squares of the heads; also the velocities of the water in the corresponding elements may be taken as proportional to the square roots of the lineal dimensions, or to the square roots of the heads. From these considerations, supported by numerous others, it appears that the quantities flowing should be proportional to the products of the squares of the heads into their square roots, or to the $\frac{5}{2}$ powers as already stated.

The friction of the fluid on the solid bounding surfaces of the passages of approach, where the water moves rapidly adjacent to the notch, may readily be assumed from all previous experience in similar subjects, not to have a very important influence even on the absolute amount of the flow of the water; and if we assume (as is known to be nearly the case for high velocities, such as occur in notches used for practical purposes, unless unusually small) that the tangential force of friction of the fluid per unit of area of surface flowed along, is proportional to the square of the velocity of flow, it follows by theory that the friction, though slightly influencing the absolute amount of the flow, will not, according to that assumption, at all interfere with its proportionality to the $\frac{5}{2}$ power of the head. And this condition will very nearly hold good if the assumption is very nearly correct.

How closely the theory thus briefly sketched may be found to agree with the actual flow of water, will be a subject for experimental investigation; and whatever may be the result in this respect, the main object must be to obtain for a moderate number of triangular notches of different forms, and both with and without floors at the passage of approach, the necessary co-efficients for the various forms of notches and approaches selected, and for various depths in any one of them, so as to allow of water being gauged for practical purposes when in future convenient, by means of similarly formed notches and approaches. The utility of the proposed system of gauging, it is to be particularly observed, will not depend on a perfectly close agreement of the theory described with the experiments; because a table of experimental co-efficients for various depths, or an empirical formula slightly modified from the theoretical one, will serve all purposes.

To one evident simplification in the proposed system of gauging, as compared with that by rectangular notches, I would here advert, namely, that in the proposed system the quantity flowing comes to be a function of only one variable, namely, the measured head of water, while in the rectangular notches it is a function of at least two variables, namely, the head of water and the horizontal width of the notch, and is commonly, also, a function of a third variable very difficult to be taken into account, namely, the depth from the crest of the notch down to the bottom of the channel of approach; which depth must vary in its influence with all the varying ratios between it and the other two quantities of which the flow is a function.

The proposed system of gauging also gives facilities for taking another element into account, which often arises in practice, namely, the influence of back water on the flow of the water in the gauge, when, as frequently occurs in rivers, it is found impracticable to dam the river up sufficiently to give it a clear overfall free from the back or tail water. For any given ratio of the height of the tail water above the vertex of the notch, I would anticipate that the quantities flowing would still be, approximately at least, proportional to the $\frac{5}{2}$ power of the head as before, and a set of co-efficients would have to be determined experimentally for different ratios of the height of the head water to the height of the tail water above the vertex of the notch.

With the aid of the grant placed at my disposal by the Association at last year's meeting, for the purpose of these researches, I have got an experimental apparatus constructed and fitted up at a place a few miles distant

from Belfast, in Carr's Glen, on the grounds of Mr. Neeson, who has kindly afforded me all the necessary facilities regarding the water supply and the site for the experiments, and I have got some preliminary experiments made on a right-angled notch in a vertical plane surface, the sides of the notch making angles of 45° with the horizon, and the flow being from a deep and wide pool of quiet water, and the water thus approaching the notch uninfluenced by any floor or bottom. The principal set of experiments as yet made were on quantities of water varying from about two to ten cubic feet per minute, and the depths or heads of the water varied from two to four inches in the right-angled notch.

From these experiments I derive the formula $Q = 0.817 H^{\frac{5}{2}}$, where Q is the quantity of water in cubic feet per minute, and H the head as measured vertically in inches from the still water level of the pool down to the vertex of the notch. This formula is submitted at present temporarily, as being accurate enough for use for ordinary practical purposes, for the measurement of water by notches similar to the one experimented on, and for quantities of water limited to nearly the same range as those in the experiments; but as being, of course, subject to amendment by more perfect experiments extending through a wider range of quantities of water.

Out of the grant of £10 from the Association for these experiments, the amount for which I have hitherto had to apply to the treasurer as having been expended in them is £8 0s. 4d., which leaves a balance remaining of £1 19s. 8d.

It will be readily observed that the experimental investigations indicated in the foregoing report as desirable, are such as would require for their completion and extension to large flows of water a great expenditure both of time and money, like as has already been the case with researches on the flow of water in rectangular notches. All that I can myself, for the present, propose to attempt is to open up the subject with experiments on moderately small flows of water; and with this view I would be glad to be aided by a further grant from the Association in continuing experiments of the kinds already undertaken.

NOTES FROM THE GOLD COAST.

By M. C. COOKE.

It would be a task scarce worthy the pains, to string together the following notes and memoranda, culled from a private correspondence, did they relate to almost any other part of the world than Western Africa. But so little reliable information comes from that quarter as to make the gossip of a letter-writer interesting to the majority of readers. Under this impression, whether true or false, I have culled the following remarks from a series of letters received during the last few years from a correspondent at Cape Coast, in the hope that they might prove of interest to your readers.

"The West African mails leaving on the 24th of each month, call on the 31st at Madeira, on the 2nd at Teneriffe, on the 6th at Goree, on the 7th at Bathurst (on the Gambia), on the 10th at Sierra Leone, on the 13th at Mowrovia, arriving on the 17th at Cape Coast Castle."

The party of eleven, of which my correspondent was one, having arrived at their destination, he confirms the following account of the general characteristics of the coast:—

"The more western portion of the Gold Coast has an undulating surface, with a bold and rocky front to seaward. But the greater part of the territory consists of level, fertile, and open plains, covered in some places with tall grass, and in others with lofty forest trees. The shores are here flat and sandy, and the whole ramp of coast is entirely destitute of harbours."—HIVANS.

This sketch is tolerably correct. There are plenty of moderate-sized hills to the rear of us, and they are all

covered with "bush" or low trees quite down to the town. The country is mountainous far to the eastward of us, and there are no bays of any magnitude on this part of the coast."

Adverting to the climate of this locality, so fearfully fatal to Europeans within twelve months after his arrival, the following information confirms its right to the title of the "white man's grave."

"But as to temperature, your dog-days would in comparison be quite cool and refreshing. There is not one European now resident in the town. The last, a young Scotch trader, died a day or two ago. Of the eleven who formed our party to the coast last year, seven have died, three have gone back very ill, and *one* remains."

"Our winter season commences in May, when the temperature falls to about 80° or 82°, with 'muggy,' rainy weather. It is the most unhealthy period, and is disliked by the natives, who are sensible of even one degree below the average warmth. Yet it is more congenial to European feelings, and as such one is pleased to exchange for it this present state of continual perspiration."

At length the rainy season arrives, and as it passes comes the consolation "we have passed through the worst part of the rainy season, and now experience alternations of fine weather and drizzling showers, and mists. I often think of the golden harvests now waving over the fair fields of England, and the interest of gathering in the successive crops of autumn, while here it is wearisome; there is nothing to mark the course of seasons except rain and dry; 'tis the same all the year round. This is a terrible place for destroying all polished metals. Razors, &c., require constant care. Put anything away for a day or two, whether of this kind or of clothing, and it may be irrecoverably injured by damp. I have just written this letter with a bad iron pen, and as to quills, you can't keep a penknife in order to mend them, owing to the damp, which, together with ants, moths, and cockroaches, makes one cry out 'persecution' many a time and oft."

Another communication, despatched in November, describes another change; it is now the "dry season," and "while, at this moment," it states "you are enveloped in a raw, cold, foggy atmosphere, scarce seeing the sun or days together, or shivering amid frost and snow, here we are under a cloudless sky, of intense blue and a burning radiance. What would we give to exchange an African unbeam for a snowball, or a few fresh-gathered icicles, luxuries for which you might have whole cargoes of the inest tropical fruits, and our barterer would esteem himself the winner of a prize. However, as it is, we must be content with such things as we have. Our pines at three half-pence; cocoa nuts, full of milk, clear as crystal and the pulp a beautiful jelly, taken out with a spoon, at one penny each. Green oranges tolerably cheap. I have just seen a bunch of oranges, about twenty in number, as closely set as a bunch of grapes. It is even here considered a wonderful production. On the whole, however, things are dearer here than in England, and heavy freights render importations very expensive. The other day I gave sixpence for a few common lucifers, which, at home, you would get for a farthing."

"With this month (November) began our summer, and its height will be in December, so that during the day it is imprudent to go out at all if it can be avoided, i.e., between 6.30 a.m. and 6 p.m., and then you have barely an hour before it is quite dark, moonlight of course excepted."

Another letter in that and also in the succeeding year, informs me that there had been no Harmattan, and that as the dry season drew towards its close, the natives were complaining that the "time was out of joint;" but that "tornadoes were daily hoped for in order to bring rain, which was much needed." Having, however, quoted enough having reference to the climate, let us turn to the people, resident and native.

"The native girls wear a 'kankey,' or artificial hump, on their backs (and nothing else) as soon as they can walk, in order to learn betimes to carry their juniors, who ride astride on the said projections. The actual usefulness of them consist in enabling the mothers to work with their infants in this way on their backs, while in England they excuse themselves from work on the plea of an infant in arms."

A circumstance is afterwards narrated in which the native population appear in less flattering colours. It occurred at a short distance from the narrator, and came somewhat officially under his notice. "A man died, and the natives inquired of the dead, 'Who killed him.' The body was carried round for the ordeal, and 'knocked' at a young man as it passed him. The savages immediately fell upon the accused with cutlasses, then left him awhile, burning and writhing in the sun, shortly to return and cut off his head."

Let us hope that such occurrences as these are few and far between, and seek relief in the doings at the garrison. "Christmas eve was most uproarious here, for exactly at twelve all the troops began firing their muskets as hard as they could through the loopholes all around the fort, making night hideous and sleep impossible. Next day they had a feast in the afternoon; moonlight soon followed, when the drums struck up for a regular dance; and where, think you, was all this capering of pas-seuls, waltzes, &c., but over the grave of poor L. E. L. and her husband—twelve flat red tiles marking the one, yellowish London bricks the other."

"But the banquet of the year for the troops is given on the Queen's birthday. A large tough piece of roast beef was the marvel of the last anniversary, with some waxy old potatoes and a dish of radishes—actually live, red radishes, and everybody was ready to jump up and knock every other body down in order to grasp and 'crunch' them. You may well congratulate yourselves on the nice things coming in with the season, while here they are all out of season all the year round—no rhubarb and sea-kale and grass; no gooseberries and currants; no new potatoes, peas, or beans; no strawberries and cherries; no apples and pears. No, nothing of the sort. But here they have fish-soup, made of dry unsalted fish, by way of a luxury; also snail-soup, with land-crabs in it. And beyond Ashantee the food consists of plantains and snails, 300 or 400 dried on a string for a dollar."

Being interested in natural history, I have at different times sent out queries relating to objects of interest believed to be known in that part of the coast. To these queries the replies have been such as are detailed below. There is no little difficulty in procuring information or specimens, as those replies will shew. And, however well-intentioned a person located on the coast may be to render service, there is evidently something even beyond that requisite, and intelligent explorers seldom venture into the interior.

"No one here takes any interest in natural history. A 'bumbafoo,' or huntsman, goes out with his gun, and brings home birds and beasts, but as to telling you anything of their character or habits, it is out of the question."

"If I attempt any inquiry, ten to one I get answers flatly contradicting each other; as yesterday, for instance, one gentleman of long experience affirming that there were no snipes on the coast, and another, of short experience, declaring he had shot them often in the neighbourhood."

"The fact is that it is as difficult to get suitable jars or bottles with corks for specimens as to get the specimens themselves, and, in some cases, more so. Suppose, for instance, I want to send such a thing as a land-crab. A jar wide enough for its reception at the mouth, is probably a vast deal too large and too heavy to be used for the purpose, and, next, how to find a cork tight enough. No shops here for such things, and probably the original

stoppers are so injured as to be useless; so that the exterior is to be as much prized on such occasions as the interior curiosities.

"I wish I could send you a large shark, which the natives are triumphantly hauling up the beach within a few yards of me. Lately I lost a very kind friend and a principal merchant at Cape Coast. A few weeks since he left the shore in a canoe to go on board the steamer anchored in the roadstead. It was upset on the surf, and, in a moment, himself and a native lady and a servant girl were devoured by these voracious monsters. They will actually jump up out of the water trying to catch men who may be suspended over a ship's side painting or cleaning the vessel.

"Savage hyenas (pattakoos they call them) prowl and growl on a low ledge of rocks between the castle wall and the ever-thundering surf every night, to see what they can find, and their horrible footprints are visible enough on the sand every morning. A few weeks ago one of these wild beasts carried off a little girl in a neighbouring town as she was incautiously venturing by herself across its path. They certainly make all kinds of strange noises, imitating many voices that are in the world, whether pigs, sheep, or fowls, in order to decoy them within their voracious clutches. We hear of some large orang-outangs having been lately seen a short distance from the town, and people now go in that direction with a sharp look out, and never alone.

"A red flamingo was brought here from Ashantee some years ago, but I cannot find any person who has seen the bird as a native. At this moment I observe the flight of seven pelicans. The marabout stork is never heard of here. Senegal and the Gambia are its localities, and you may get the tail-feathers sometimes for a dollar, sometimes for ten or twelve, or not at any price. The merchant's general charge is 24s. per ounce. Wild ducks are sometimes visible in the air; Muscovy ducks waddling on the ground; common domestic ducks are now in the larder, but very lean indeed. There are plenty of wrangling, quarreling, spiteful, pugnacious, love-birds. Gulls seen occasionally. The secretary bird not known here. There are plenty of the crown bird or crowned crane on the Coast, but not on this part of it. Locusts, not the Egyptian, are sometimes here in clouds, eating up everything.

"You will be glad to hear that an important desideratum is about to be supplied, in a work by Mr. Louis Fraser, naturalist to the last Niger expedition, on the Birds of Western Africa, with coloured plates. It is advertised in a Sierra Leone paper.

"The ordeal bark is, I believe, from a tree in the interior, and is often administered as the test of guilt or innocence, but it is easily so prepared as to act either way, for or against the accused; retained if guilty, omitted if innocent. Various seeds and small cowries are cut into uniform shapes, to be worn like beads.

"The fruit called here a plum,* in shape and colour resembles a damson, but the pulp is more like tasteless pith than anything else. I have also heard of a peach here,† but it is nothing like our own, being merely a thin skin over a large stone."

From this locality I have received specimens of *Essouwee* (or teeth cleaner), a bunch of fibre of a coarse description, used there for that purpose and chew-sticks, which have a like application; a rough fibre, called *Essou*, obtained from a creeping plant, and used for personal washing instead of sponge; *Broodewah* or the fibre of the plantain, used for the same purpose; Pine apple fibre, used by the natives for making their fishing nets; plait for hats, made from the date palm; Cola nuts (fruit of *Sterculia acuminata*), ground nuts (*Arachis hypogea*), these are taken from the shell, parched, and eaten; Tiger nuts (the small tubers of *Cyperus esculentus*),

"these are chewed, not swallowed. When pounded with water, about a cupful of nuts to a cup and a-half of water, strained, simmered, and cooled down, the result is a nice sweet kind of solid creamy substance;" *Lobates* or physic nut, a species of *Jatropha*; Canna seed or Indian shot, and other seeds; palm nut kernels, gum copal, cotton, together with landcrabs, scorpions, birds, insects, &c., of no general interest. Without doubt there are many products of the Coast which would be commercially valuable, but no energy or skill on the part of the natives to make the most of their natural advantages. My correspondent writes,—

"There is plenty of field here for trade; the riches of nature are in abundance, without art to get them. Palm oil, gold-dust, ivory, pepper, &c., but the climate is *per contra*.

"The principal export trade here is gold dust; they send about 20,000 ounces annually to England, and formerly much more. The palm oil trade is more to leeward, and ivory to the west or windward.

"The export of dust last year was £32,308 to England, £200 to America, and £600 to other places. About 140 to 150 tons of ivory are annually sent from the coast. About £40,000 in value of palm oil to England, £30,000 to America, and £20,000 to other places. A small portion of palm oil is shipped from Cape Coast, but by much the greater is sent from the most easterly parts of the coast. These are several other exports from the gold coast, amounting in all to £140,000 or £150,000 annual value.

"Liberated Africans have a remarkably keen eye to the native dust. So much so that before long I think the traders of that class will drive the white men out of the field. At this place, a few years ago, there were forty European merchants, and now not one. There are only two or three white agents and clerks for African houses. The competition has been ruinous to the mercantile speculators.

Commerce and the condition of the place generally are, as they say, looking down. Not even a "bumbafo" to be heard of, all owing to customs' dues burdening trade here, while our Dutch neighbours, close at hand, up and down, are quite free."

Trinity School-house, Lambeth.

INTERNATIONAL DECIMAL ASSOCIATION.

At a meeting of the council of this association held on Thursday, the 28th October, the following report on the meeting of the National Association for the Promotion of Social Science, held in Liverpool, was presented by James Yates, Esq., vice-president, and adopted:—

"The late meeting at Liverpool was attended by the Earl of Shaftesbury and Mr. James Yates, two of the vice-presidents of the International Association; by Charles Paget, M.P., Edwin Chadwick, C.B., William Fairbairn, F.R.S., Dr. Farr and Dr. Hodgkin, members of the council; and Dr. Lee, T. T. Barnard, Esq., M.P., Professor Hennessy, Dr. Hine, Mr. Thomas Michell, H. G. Bohn, Esq., Mr. Fitch, Mr. Ashton Yates, Professor Traill of Edinburgh, and others. In consequence of the great number of memoirs presented to the fifth department, the general secretary, G. W. Hastings, Esq., proposed that those relating to decimal measures, weights, and coins, should be referred to a special section. This arrangement was attended with great advantage. The subject occupied the entire morning of Friday, October 15th, and one of the most spacious and commodious apartments in St. George's Hall was appropriated to the section. Lord Brougham, at whose suggestion the introduction of this topic had been resolved upon, kindly consented to take the chair, and the audience was numerous and attentive. At the commencement of the business Mr. James Yates produced letters from Viscount Ebrington, M.P., J. B. Smith, Esq., M.P., Professor L.

* *Malpighia saccharina*.
† *Sarcocephalus esculentus*.

Levi, the Dean of Hereford, Mr. H. N. Sealy, formerly of Liverpool, M. Michel Chevalier, of Paris, M. Nordling, of Paris, M. Lamanevsky, secretary to the Geographical and Statistical Society of St. Petersburg, the Rev. Eugene Popov, Chaplain to the Russian embassy, M. Delavaleye, of Brussels, and other gentlemen, apologising for their absence, and expressing great interest in the plan of the International Association. Seven memoirs were read, as follows:

"Wm. Brown, Esq., M.P. for South Lancashire, showed the great trouble, inconvenience, and loss of time produced by the established system of money, observing that, if a decimal coinage were substituted for it, compound arithmetic would be superseded, and all calculations of accounts exceedingly simplified.

"Mr. Samuel Brown, Vice-President of the Institute of Actuaries, gave an account of the origin, plans, and objects of the International Association, a task for which he was singularly qualified, from having been one of its original founders, and uniformly a member of its council.

"The Rev. Alfred Barrett, M.A., North Chream, Surrey, explained the advantages of the metrical system of measures, weights, and coins, in reference to education, and stated, as the result of his own observation, that the adoption of this system in the British Islands would be a saving of time in the instruction of boys, amounting certainly to more than a year, perhaps almost two years.

"Mr. James Yates enumerated the points which seem to require attention, in order to arrive at a good system of decimal coinage, viz., the alloy, the seigniorage, the remedy, the standard of value, the unit, the denominations, the number of decimal places, the highest and lowest coins, the relation to weights, the international principle, and Mr. Sealy's proposal of an international bank. He stated various facts in regard to each of these topics, and illustrated their application in trying the merits of different schemes.

"Mr. Tefft, Art Commissioner from Rhode Island, United States, having noticed the obstacles to commerce, and the perplexities to travellers, produced by a variety of monetary systems, proposed that a gold coin, equal to the new five-franc piece now current in France, should be the unit, and showed how, by slight modifications, the coinages of France and England and the United States, might meet upon this basis. He recommended that the coinage should be in strict unison with the weights and measures of the metrical system, and that the copper coins should be identical in weight and value with those of France.

"The Rev. O. H. Bromby, Principal of Cheltenham College, recommended the franc and centime system of coinage, with a gold coin of 100 francs in value, and entered into calculations to show the advantages of the system.

"Mr. Theodore Rathbone contended that a decimal system of measures, weights, and moneys might easily be adopted if a familiar quantity were taken as a standard, such as the pound weight, the yard, and the penny, and if these were adjusted to similar quantities in other countries.

"The reading of these papers, with the discussions upon them, occupied more than five hours. The international principle was opposed as chimerical and impracticable by Mr. W. Brown, Lieut.-General Sir Charles Pasley, and Mr. R. B. Moore. It was ably and strenuously defended by Mr. Theodore Rathbone and by Professor Hennessy.

"Remarks were made on the great value of the preliminary report presented by the Decimal Coinage Commission, of which Lord Monteagle is chairman, and especially on the importance of the information obtained from France, Belgium, Switzerland, the kingdom of Sardinia, and other foreign countries.

"Mr. Tite, M.P. for Bath, stated, as the result of his

experience in various works which he had executed on the Continent, that the practical advantages of the metrical system are great almost beyond conception.

"Mr. McCann, M.P. for Drogheda, announced his intention of bringing in a bill in the next session of parliament for the abolition of dry measure.

"Mr. Philip Rathbone, local secretary, stated that he was in the habit of changing English accounts into the monetary scale of nations using the decimal system, and that this process, by enabling him to use logarithms, not only effected a saving of three-fourths of the time in computation, but afforded the best security against error.

"Notwithstanding the opposition of sentiment between the advocates of the pound and mil scheme and those who recommended an international system comprising measures, weights, and coins, there was only one feeling of admiration and gratitude towards the officers of the Association for Promoting Social Science, which had so liberally afforded the opportunity for discussion."

ROCK SALT IN PRUSSIA.

A correspondent of the *Daily News*, dating from Stettin, states that a discovery of the utmost importance for the trade of Prussia and the countries on the Baltic generally, has lately been made at a place called Strassfurt, near that city, consisting of an inexhaustible bed of pure rock salt. It is now some months since vague and uncertain reports of the discovery were circulated there, but they were at first discredited, on the ground that the geological features of Pomerania, being of alluvial and diluvial formation, were not of a nature to cover a large deposit of salt, although it was known that there are, in many parts of the province, saline springs which are used by the government for the artificial manufacture of salt.

The fact of the discovery is, however, now stated to be well authenticated. A small cargo has been sent this summer to Scotland, to be used in salting herrings, and the quality is said to be even superior to the Liverpool rock salt. As these salt beds are of very considerable extent, and from their proximity to the sea, the produce can be raised and shipped at a very low figure, the discovery is likely to bring about an important revolution in the salt trade, which, in Prussia, is a government monopoly; indeed, the Minister for Commerce has, in consequence of the discovery, ordered the saline works at Colberg and Cösen to be discontinued, it being found impossible to compete profitably, by any artificial means, with this prolific natural store. Government has fixed the price for the present at six silbergrochen per centner (equal to about 11s. sterling per ton), delivered free on board at Strassfurt, which is about the shipping price at Liverpool. It is, however, thought probable that a great reduction will take place, as the actual cost of production only amounts to one-fourth of the above figure.

The writer adds:—"Under these circumstances the large importations of salt annually received from England will, of course, altogether cease, and the Strassfurt rock salt will be able, from the extreme cheapness of its production, to compete successfully with Liverpool for supplying Russia and the other Baltic States with this necessary article, thus creating a new and lucrative branch of commerce for the merchants of Prussia. An unlimited supply of cheap salt will also have a corresponding favourable effect on the development and increase of many chemical articles manufactured in Prussia, in which salt is the principal ingredient. The falling-off in our imports of salt, soda, &c., will, however, be more than compensated by the increase of exports in this town which cannot fail to take place, and thus tend to restore the just equilibrium between our imports and exports, the former having, for several years past, considerably predominated—so much so, that a large part of the vessels bringing goods to Stettin are unable to find

return freights, and are therefore compelled to sail in ballast, which tends to materially raise the inward freights on cargoes bound for this port."

Home Correspondence.

SHIPPING REGISTRATION, TONNAGE, AND ENGINE-POWER.

SIR,—The *Journal of the Society of Arts* having been liberally thrown open to public discussion on the deficiencies and absurdities of our present system of Shipping Registration and Tonnage and Engine-power admeasurement and record, as exemplified by the papers, "Steamship Capability," "Tonnage Registration," and "Mercantile Steam Transport Economy," published in the *Society of Arts Journal* for the 18th May, 1855, 18th January, 1856, 16th and 22nd August, 1856, and 28th August, 1857, I now request the favour of your giving insertion to the inclosed excerpts from City articles of the *Times* for the 25th and 30th Oct., as a practical confirmation of the anomalies to which I have endeavoured to direct public attention by the papers above referred to.

I am, &c.,

CHARLES ATHERTON.

Woolwich Dockyard, 27th Oct., 1858.

[EXTRACTS REFERRED TO.]

The following is the explanation furnished regarding the discrepancies between the alleged and actual tonnage and horse-power of the vessels named in the prospectus of the new Atlantic Steam Company from Galway. The registered capacity is rarely heeded, and it is now a general custom for each shipbroker to suit more or less his own fancy as to the limits within which he will confine his descriptions. An immediate and authoritative reform should be brought about:—

"8, Philpot-lane, London, Oct. 23.

"SIR,—Pressure of business has hitherto prevented us from noticing an extract from the *Liverpool Courier* of the 9th inst., and recently commented on by you, which seems to have been widely circulated in this city with an object which is very apparent. As the advertising of the steam-ships of the Atlantic Royal Mail Steam Navigation Company rests with us, as the brokers to the company, we beg to state in explanation, that in advertising the burden tonnage of the ships and effective power of their engines, we merely followed the custom generally prevailing among brokers, and the only omission we can admit is that of the words 'burden' and 'effective,' which henceforth you will see in our advertisements in the columns of your paper. We enclose advertisement slips cut out of your paper of this date and those of your contemporaries, from which you will see the custom above alluded to is general, and we may add, that in more than one of our ships we have considerably understated both burden and effective power.

"Every one acquainted with shipping is aware that the Customs' admeasurement tonnage and the Admiralty horse-power are merely nominal, and not at all indicative of the actual burden of ship or horse-power of engines.

"For the information of the curious, we refer them to the last Merchant Shipping Act, wherein they will find the key to the relative proportion between register and burden tonnage, and from which they will see our advertisements are not overstated.

"We are, Sir, your obedient servants,
"BAKE, ADAMS, AND Co."

The following relates to the controversy which has arisen out of the recent advertisements of the Galway Atlantic Steam Company, as to the practice of the shipbrokers of London and Liverpool in describing the tonnage and power of vessels. It is evident that much

laxity has prevailed, and that the time has arrived to put a stop to it. There could be no objection to brokers giving their own estimates, providing the official figures are also stated:—

"London, Oct. 23.

"SIR,—Will you allow me to point out two or three things in reference to the controversy respecting the advertisements of the Galway line of steamers? Considering the locality whence the attack made on the new company was commenced it is not very difficult to understand the motive. For years past I have advocated schemes of which the Galway undertaking forms a part, and to the complete realization of which I believe that it will ultimately lead; I therefore naturally entertain a just indignation when I see that which I consider contrary to truth and fair-play put in requisition to injure the Galway line in public estimation. This, I am persuaded, you will never for a moment countenance, and I address to you these few lines, either for publication or not as you may think proper. You inserted a letter signed 'Veritas' in your City Article of to-day, the writer of which says:—

"I enclose you the advertisement of every Transatlantic steam line advertised in the Liverpool newspapers, and the Galway line is the only one stating an imaginary tonnage."

"Now I do not know what the Liverpool papers advertise, but I beg to refer you to *The Times* of this date for the advertisements of Liverpool steamships. There you will find at the bottom of column IV., page 1, of the supplement, the *Great Britain* (of a Liverpool line, and belonging to Messrs. Gibbs and Co.) advertised as 3,500 tons register. I turned to the *Steam Shipping Register* this afternoon, and found her there registered as 1,811 tons. The *Eagle*, which appears directly after, is advertised as 2,600 tons, and I find in Lloyd's book that she is registered 1,020 tons.

"Again, turn to the White Star line and Black Ball lines. I find certain vessels belonging to these advertised as of 5,000 tons burden. It is true that the registered tonnage of these lines is given, which is by no means generally the case. But their advertisers, in estimating their burden in proportion to their registered tonnage, have, I think, somewhat exceeded Messrs. Bala Adams, and Co.'s calculation. All that Messrs. Bala Adams, and Co. can be accused of is, that they have left out their register column and given the burden of their vessels alone. That this is by no means a singular proceeding is sufficiently proved by *The Times'* advertising columns of to-day.

"I am, &c.,

"SCRUTATOR."

Proceedings of Institutions.

WARMINSTER ATHENÆUM.—The opening of the new buildings recently erected by the members of the Warminster Athenæum, was inaugurated on Thursday, the 28th ult. A public meeting was held in the lecture-room, at which the Marquis of Bath presided, supported by the Right Hon. Sidney Herbert, M.P., Lord E. Thynne, the Hon. and Rev. S. Best, Mr. E. Baines of Leeds, president of the Yorkshire Union of Mechanics' Institutes, the Rev. A. Fane, vicar of Warminster, and a large number of the gentry and clergy of the town and neighbourhood. The Marquis of Bath opened the proceedings in a brief speech, in which he pointed out the advantages which the town of Warminster would receive from the establishment of the institution.—Mr. WARREN, the secretary, then, at the request of the chairman, read a statement of the financial position of the Institution, after which the Right Hon. S. HERBERT, M.P., rose to move the first resolution. He began by contrasting the mode in which such Institutions as this were established in France.

where the support and patronage of the Government were considered essential to success, with the more independent system adopted in England. With reference to the advantages of such Institutions, he confessed he was at a loss what to say, for during the last six weeks we had had this subject put before us in every possible light, and argued in every possible manner by the most illustrious and able men which the country had produced in the present day. He thought, however, that the discussions which had lately taken place, had enabled us to get at a far more correct view of what the intentions and objects of these Institutions really were, and what they were likely to accomplish, than we possessed before. He recollected at one time, that the opinion very much taken up was, that these Institutions, by offering to all the means of studying abstruse science, would have the advantage of creating, at any rate of increasing, the number of eminent men in literature and science—that they would, in point of fact, be the nurseries of men like Hugh Miller, Stephenson, or Dr. Livingstone—men who struggled through every disadvantage in their determination to encounter and conquer learning. For his part, he did not believe that Institutions of this kind had any such effect, and he did not think it right that they should have any such effect. Men ought to meet here for purposes of intellectual recreation, and not necessarily for laborious study. Stephenson, Hugh Miller, and such men did not want opportunities given to them, they made them. They were not the creatures but the authors of opportunity. The fact was that when people made rules for others, they took a very high standard. They were very virtuous when making regulations to affect the conduct of other people, and many of these societies had begun by purging their libraries of books of amusement. He was not against offering abstruse books to those whose tastes would lead them to study science, but let them not let their library be restricted to such books. Really good novels were, in his opinion, a great school of human nature, and such works were not out of place in the library of a literary institution. Then, again, the reading of newspapers in these Institutions was equally justifiable. They were, in fact, contemporary history, besides giving us most admirable discussions upon all the questions of the day. It was true that at present newspaper writers were anonymous, and his belief was that, for the mission of public instruction, that was a great disadvantage, as it put on a par, in point of weight and authority, the most scrupulous and the most unscrupulous writer—the most exact and the most inexact. He had stated his views on this point, because it was to the press that we must look for the formation of the great mass of public opinion on political and social questions, and it was of importance to watch with the greatest care any defects capable of remedy which diminished the good influence the press exercised. The diffusion of information had contributed to the present comparative absence of party spirit in the country. The mass of the people were now as intelligent as those they returned to represent them, and the result was that, judging for themselves, they found some good on one side, some on another, and they would not yield themselves blindly to the lead of any one man or party in the State. The proposed extension of the suffrage would, if carried, produce an enormous extension of that jury which was to decide in a calm reasoning manner on the great questions of the day. Learning, then, must no longer be a monopoly of those who had leisure and wealth to obtain it, but it must go further, and for such a purpose institutions such as this were invaluable. In conclusion, he trusted that they would agree with him in accepting with warmth and cordiality the resolution which he had then the honour to read to them, “That the Warminster Athenæum, being an Institution calculated to advance the moral, social, and intellectual progress of the town and neighbourhood, the cordial thanks of the public are due to its promoters.”—The Hon. and Rev. S. BART, in seconding the resolu-

tion, said he dissented from some of the opinions which Mr. Sidney Herbert had expressed. He took a somewhat sterner, and, perhaps, not so agreeable, a view of the duties of an Institution like this. He admitted the social advantages to be derived from reading good novels or newspapers, but other matters were to be attended to in training the mind in order to enable it to distinguish the force of truth. The great object of Institutions such as this was, in his opinion, to take the young when they left school, to educate them practically, and continue their education either by means of mutual instruction or by means of appointed masters. The resolution having been unanimously agreed to,—Mr. EDWARD BAINES proposed the next resolution—“That this Institution recommends itself to the support of the friends of education, as designed to promote the self-improvement of the young, and the general diffusion of knowledge apart from religious and political opinion.” He agreed most cordially with what had been said by the right hon. gentleman in regard to the desirableness of not forbidding in these Institutions relaxation and intellectual amusement. Very many years ago he had dissented from the view taken of Mechanics’ Institutes by their founders, Dr. Birkbeck and Lord Brougham, that they should be entirely devoted to scientific study, and he believed experience had since proved that he was right. At the same time he thought there was something higher to be gained from Mechanics’ Institutions than mere intellectual amusement. He, therefore looked with much satisfaction upon the efforts which had been made in the town of Warminster to extend their institution and render it more useful.—The Rev. A. FANE seconded the resolution, which was unanimously agreed to. Several other addresses having been delivered, the proceedings terminated with a vote of thanks to the Chairman. After the meeting a dinner took place at the Town Hall, at which the Marquis of Bath presided, and the festivities were concluded by a *soirée* in the evening.

MEETINGS FOR THE ENSUING WEEK.

- Mon.Geographical, at Burlington House, 84. I. Mr. R. F. Thomson and Lord Schomberg H. Kerr, “Journey through the Mountainous Districts North of the Ebury, and Ascent of Demavend, in Persia. II. Mr. A. C. Gregory, “Journey from Moreton Bay to Adelaide in search of Leichhardt.” III. Mr. F. Gregory, “Exploration of the Murchison, Lyons, and Gascoyne Rivers in Western Australia.”
- Tues.Syrro-Egyptian, 71. Mr. W. F. Alasworth, “On Ancient and Modern Antioch.”
- Civil Engineers, 8. Mr. J. S. Valentine, M. Inst. C.E., “Description of the Lisbon and Santarém Railway.”
- Med. and Chirug., 84.
- Zoological, 9.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette, Oct. 29, 1858.]

Dated 22nd September, 1858.

2132. C. W. Harrison, Woolwich—Imp. in filters for purifying air and liquids.

Dated 11th October, 1858.

2260. R. Cowen, jun., Nottingham—Imp. in dressing lace or other fabrics made of silk, cotton, or other material, and in apparatus employed therein.

Dated 12th October, 1858.

2269. J. F. Swinburn, Birmingham—Imp. in fire-arms.
2271. T. C. Shaw, and F. H. Cooper, Hasley, Staffordshire—A new or improved construction and mode of working engines by the agency of air or gases in conjunction with electricity for obtaining or producing motive power.
2273. W. Smith, Edinburgh—Imp. in transferring drawings or delineations in lithographic and zincographic processes.
2275. J. A. Gasse, Paris—Imp. in railway breaks and in apparatus for working the same.

Dated 13th October, 1858.

2278. J. Parkins, 1, Hanway-street, Oxford-street—Imp. in securing envelopes, and in fastenings to be used therein.
2279. H. Parker, Sledmere Castle, Yorkshire—An improved apparatus for the cultivation of land, and other agricultural operations.

2280. R. Ridley, Low Wortley, Yorkshire—Imp. in safety cages for mine shafts.
2281. W. H. Treacher, Blackfriars-road—Imp. in respirators.
2282. A. G. Brady, Reading, Berkshire—An imp. in connection with collars and ties, or other like articles of dress.
2283. A. Benda, 79, Basinghall-street—Imp. in the manufacture of models of the human and other figures to be used as toys, for tuition, and for other purposes. (A com.)
2284. J. Braby and J. Braby, jun., Bridge House-place, Newington Causeway, Southwark—Imp. in wheels and wheeled carriages to be propelled by steam, horse, or other power, and in apparatus for retarding the same.

Dated 14th October, 1858.

2285. J. C. Ollerenshaw, Manchester—An imp. in "cotton gins." (A com.)
2286. H. Liddle and J. Booth, Tongue, near Middleton, Lancashire—Certain imp. in machinery or apparatus for polishing and finishing yarns or threads.
2287. L. Cowell, Adelphi—Imp. in apparel affording the means for preserving life at sea, and to prevent accidents to persons casually immersed in water.
2288. A. Gordon, Little Fife-house, Whitehall—Imp. for manufacturing cast iron, steel, and wrought iron. (A com.)
2289. T. Ingram, Bradford, Yorkshire—Imp. in means or apparatus for signalling between the parts of a train of carriages.
2290. S. Perkes, Clapham—Imp. in machinery for extracting oil from the coconuts and other vegetable matters.
2291. H. Martin, Old Kent-road—Imp. in separating starch from gluten in apparatus used therein, and also in preparing cement from gluten.
2292. G. Baxter, Northampton-square—Imp. in colouring photographic pictures.
2293. T. Archer, jun., Dunston, near Gateshead—Imp. in apparatus for preventing explosions of steam boilers.
2294. S. Diggle, Radcliffe, Lancashire—Imp. in looms for weaving.
2295. W. E. Newton, 66, Chancery-lane—An improved construction of cabin or state room for steam boats and other vessels. (A com.)
2296. J. Lomas, Manchester—Imp. in the production of ornamental fabrics for ladies' dresses.

Dated 15th October, 1858.

2297. R. R. Jackson, Blackburn, Lancashire—Certain imp. in machinery or apparatus for sizing yarn.
2298. W. Bacon, Prestwich, Lancashire—Imp. in the mode of constructing valves, valve cocks, gates, and stopcocks, which may be used in steam engineering, and for other purposes. (A com.)
2299. G. Davies, 1, Serle-street, Lincoln's-inn—Imp. in the manufacture of gloves, and in the apparatus employed therein. (A com.)
2300. T. Moore, Sheffield—Imp. in refrigerators.
2301. S. T. Clarke, 30, Kildare-terrace, Westbourne-park—A mode of crossing bankers' cheques and drafts.
2302. J. Wainwright, Birkenhead—Imp. in respirators.
2303. G. T. Bousfield, Loughborough-park, Brixton—Imp. in machinery for cutting the threads of wood screws. (A com.)
2304. G. F. Wilson, Belmont, Vauxhall—Imp. in preparing compounds containing sulphur for preventing and destroying blight, mildew, and insects.

Dated 16th October, 1858.

2305. L. Marcus, Algiers—An improved reaping machine.
2306. F. J. Coulton and S. G. Giraud, 2, Rue sainte-Apolline, Paris—Imp. in the process of ornamenting silk and leather.
2307. T. W. G. Treby, 1, Westbourn-terrace Villas, Paddington—An imp. in breech-loading fire-arms and cannon.
2308. H. Francis, 456, West Strand, Westminster—Machinery for making the springs of surgical trusses.
2309. J. Hick, W. Hargreaves, and R. Harwood, Bolton-le-Moors, Lancashire—Imp. in governors or regulators for prime movers.
2310. P. Jensen, Mount-gardens, Westminster-road, Lambeth—An improved apparatus for governing or regulating the speed of marine engines.
2311. A. Robertson, Lonsdale, Renfrew, N.B.—Imp. in applying starch and similar matters.
2312. A. Dunn, Dalston terrace East—An imp. in preparing marking compounds to be used on linen and other fabrics.
2313. B. Nickels, Mitcham, Surrey—Imp. in electric telegraphs.

Dated 18th October, 1858.

2314. W. Clay, Ellesmere, Shropshire—Imp. in combined thrashing and dressing machines.

2315. J. A. Mason, Wirksworth, Derbyshire—Imp. in washing machines and apparatus for wringing and mangling.
2316. W. A. F. Powell, Bristol—Imp. in stopping or closing jammed bottles.
2317. C. West, 15, Mornington street, Camberwell New-road—Imp. in the mode of insulating and covering wire.
2318. R. Tidman, Jermyn-street, St. James's—Imp. in machinery or apparatus for paying out and for raising electric telegraph cables.
2319. R. A. Brooman, 166, Fleet-street—Imp. in the manufacture of small chains and links for the same. (A com.)
2320. K. H. Cornish, 17, Chapel-street East, May Fair—A new mode of advertising.
2321. W. E. Newton, 66, Chancery-lane—Imp. in apparatus for lighting gas and other lamps. (A com.)
2322. A. W. Drayton, Capt. R.A., Plumstead, Kent, and C. R. Binney, Capt. R.E., Woolwich—Imp. in submarine telegraphic cables.
2323. J. Smith, Newport, Salop—Imp. in rough-shoeing beasts of draught and burden.

Dated 19th October, 1858.

2324. J. Whitworth, Manchester—Imp. in guns, gun-carriages, and ammunition.
2325. J. Owen and H. Duckworth, Blackburn, Lancashire—Imp. in looms.
2326. J. Richmond, 21, Carlisle-terrace, Fairfield-road, Bow—The construction of valves applicable especially to water meters, and other instruments for measuring fluids, and all hydraulic purposes.
2327. W. E. Newton, 66, Chancery-lane—Imp. in the hanging and arranging of cylindrical conical or spiral steel railroad springs, for railway carriages. (A com.)
2328. R. A. Brooman, 166, Fleet-street—Imp. in propelling vessels. (A com.)
2329. W. Kiddle, 1, Westbourne terrace, Barnsbury-park—Imp. in packing or forming merchandise or goods into bales.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2330. E. B. H. ern, Massachusetts, U.S.—An improved compensation apparatus for a hair-spring balance for a watch or timepiece. —21st October, 1858.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Nov. 2, 1858.]

November 1st.		1070. J. Sharpley.	
775. P. Brun.	976. E. S. Trower.	1082. H. Hyde.	1112. M. Henry.
989. J. Swain and M. Swain.	995. C. D. Archibald.	1173. W. E. Newton.	1207. J. Stuart.
1000. J. Lawson and T. Robinson.	1014. W. Clark.	1209. T. Dunn and W. Irlam.	1204. J. F. Lackersteen.
1018. J. Bunnett and J. G. Bunnett.	1019. C. J. Carr.	1218. J. Schloss.	1300. E. T. Hughes.
1019. C. J. Carr.	1030. W. Hart.	1332. G. W. Hart.	1425. W. E. Newton.
1037. W. Clark.	1036. A. W. Newton.	1609. C. S. Putnam.	1702. W. A. Gilbee.
1043. I. L. Bell.	1054. W. Fara.	1735. J. Houston.	1836. G. Mezier and J. Waddell.
1055. R. Halliwell.	1060. J. M. Gilbert.	1894. H. Hood.	1934. J. Coates.
		2038. J. G. Newberry.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[From Gazette, Oct. 29, 1858.]

October 25th.		2429. T. J. Swinburne.	
2408. G. Riley.	October 26th.	2430. T. S. Grimwade.	October 27th.
2427. H. E. Drayton.		2451. R. Cook.	
October 28th.		October 30th.	
2470. G. Collier.	October 29th.	2487. G. Miner.	2439. W. Taylor.
2419. W. Naylor.		2442. A. E. L. Bellford.	2452. W. Staufen.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4123	Oct. 14.	Stay Fastener	J. McLintock	Westgate House, Barnsley.
4124	" 15.	The Horizontal Dome Inkstand	D. W. Lovell & A. Wilson	9, Wine Office-court, Fleet-street.
4125	" 15.	Revolving Panoramic Stereoscope	J. Cramb	54, Magdalen-yard road, Dundee.
4126	" 20.	Improved Bench Vice	Easterbrook & Allcard	Albert Works, Sheffield.
4127	" 21.	Spring for Binding Boot and Shoe Heels	H. E. B. Farmer	Northampton.
4128	" 25.	Brown's Improved Convex Washing Board	C. Brown	Market-place, Leicester.
4129	Nov. 2.	Cinder Sifter	D. Jones	Dartmouth-street, Birmingham.
4130	" 3.	Hinge	J. Sadler and T. Davis	Birmingham.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 12, 1858.

COUNCIL.

The following Institutions have been taken into Union since the last announcement:—

Leicester, Town and County Church of England Institute.
Woolwich, Charlton, and Plumstead Literary and Scientific Institute.

NOTICE TO MEMBERS.

The One-Hundred-and-Fifth Session of the Society will commence on Wednesday next, the 17th inst. The Chair will be taken at 8 o'clock on the following Wednesday Evenings:—

1858. November.....	—	—	17	24	—
„ December	1	8	15	22	—
1859. January.....	—	—	19	26	—
„ February	2	9	16	23	—
„ March	2	9	16	23	30
„ April.....	6	13	—	27	—
„ May.....	4	11	18	25	—
„ June.....	—	—	—	—	29*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 17.—Introductory Address on the Opening of the One-Hundred-and-Fifth Session, by the Chairman of the Council, Mr. C. WENTWORTH DILKE.

* * On this evening the Medals which were awarded by the Council for Papers read at the Weekly Evening Meetings during the last Session, and

* The Annual General Meeting: the Chair will be taken at 4 o'clock. No Visitors are admitted to this Meeting.

for articles submitted to the Society's Committees, will be distributed.

November 24.—Mr. F. JOUBERT. "On a Method of rendering Engraved Copper-Plates capable of Producing a greatly-increased Number of Impressions."

December 1.—Mr. HYDE CLARKE. "On Copper-Smelting."

December 8.—Mr. P. A. HALKETT. "On Guideway Agriculture; being a System enabling all the Operations of the Farm to be performed by Steam Power."

December 15.—Mr. E. J. REED. "On the Modifications which the Ships of the Royal Navy have undergone during the Present Century, in respect of Dimensions, Form, Means of Propulsion, and Powers of Attack and Defence."

December 22.—Dr. FORBES WATSON. "On the Growth of Cotton in India."

ADAMS'S SYSTEM OF PERMANENT WAY.

In February, 1856, an account was given in the pages of this *Journal* of a system of Wrought-iron Permanent Way for Railways, by Mr. W. Bridges Adams, denominated the Suspended Girder Rail. The testimony in its favour by several eminent railway engineers, and the practical experience since gained confirmatory of their opinions, together with its adoption for more than one important line, make it probable that this class of way will be ultimately preferred, wherever iron is considered imperative and timber inadmissible. Experiments are still going on to ascertain the minimum of bearing surface which will suffice, in order to keep down the weight and cost to the absolutely requisite quantity, and it is probable that a considerable reduction will be the result. For the purposes of export to India this is of great importance, as every ton weight averages thirty shillings for freight—about one-sixth added to the original cost of the materials. And wrought-iron is in all structures a very considerable reduction of dead weight, with equal strength and greater security as compared with cast-iron. The two sections hitherto applied are as follows:—Single-headed (Fig. 1) and Double-headed (Fig. 2).

FIG. 1.

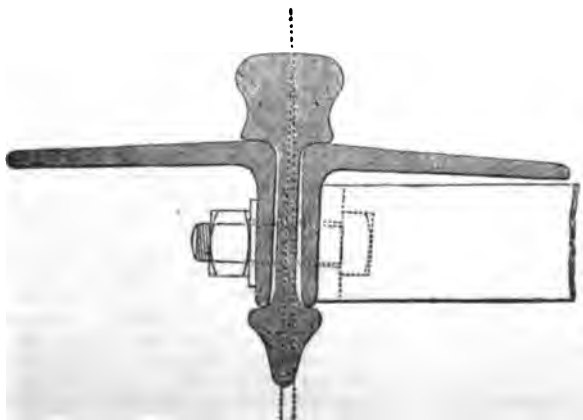
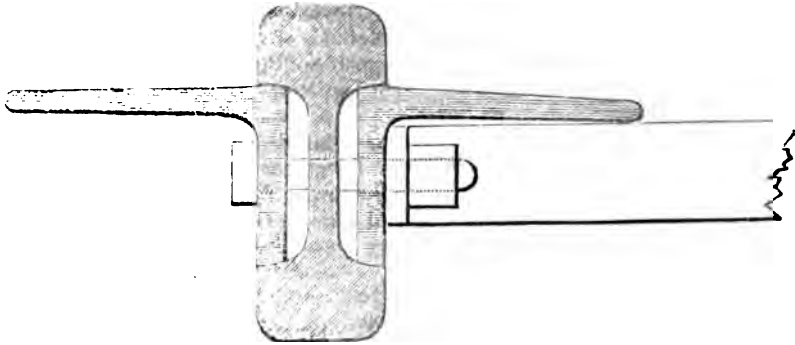


Fig. 2.



Meanwhile two of the highest Indian authorities—the East Indian Railway and the Great Indian Peninsular Railway—appear to consider the question of iron sleepers a most important point, judging from their half-yearly reports. The East Indian engineer states that the cast iron sleepers are a comparative failure, and that they are being removed into branches and sidings, and being replaced on the main line with timber sleepers. The Great Indian Peninsular engineer, on the contrary, states that the destruction of timber sleepers is as ten per cent. compared with five per cent. of the cast-iron sleepers. In the absence of specific information as to the cause of failure, it is to be presumed that the failure of the cast-iron is from breakage—a defect from which the wrought-iron system is free—and the failure of the timber must be either from the white ant or from splitting by moisture and heat.

Structure has, no doubt, much to do with it, both in the case of iron and timber. A bad form of cast iron will ensure breakage even with a surplus amount of weight, and the mode in which timber sleepers are commonly used with double-headed rails, both in England and India, is not favourable either to the durability of the rails or timber.

The timber sleepers are usually ten inches in width, five inches in depth, and from nine to ten feet long. At each end of the sleepers is fixed down, by iron spikes or wood trenails, a mass of cast iron called a chair, now usually varying from 25 lbs. to 42½ lbs. each. In these chairs, the distance of which apart on the sleeper determines the gauge, are fixed the rails, the opening being sufficient to drop them in from above, and they are secured by wooden keys driven in laterally outside. The rail is composed of three members or portions, the lower table, the upper table, and the vertical web, which connects them together. The rail resting in the chair on its lower table acts as a prop to sustain the wheels. If the rails and chairs are always in contact, no blow will ensue, and when the upper table is worn out by work, it may be turned down, and the lower table will supply an unworn surface, with only the defect of a bad bearing in the chair, by reason of the worn surface of what was the upper table. But, practically, the running of the wheels causes lateral blows which crush the wooden keys, and the rails get loose in the chairs, striking a succession of hard blows well-known to passengers, crystallizing the texture of the rails, and destroying their upper surface by the blows of the wheels and their lower surface by blows on the chairs. All this is aggravated by the great elevation of the rails above the bearing of the sleepers on the ballast. The rail is five inches, the chair two inches, and the sleeper five inches, total twelve inches; thus any loosening of the wood key is aggravated by the height of the prop, and a rocking motion ensues which disturbs the bearing of the sleepers, and, in wet weather, lets in the water beneath them. To solidify the sleepers below, it

is thus needful to dig out 12 inches of material to get at them, and this leaves loose ballast above when again filled in, which is disadvantageous in many ways. In this particular the wrought iron suspended girder is particularly advantageous. It is not requisite to open up the ground to get at it, and the upper surface is always firm and solid.

The principle of the wrought iron way, *i.e.*, suspending the rail from the upper table instead of propping it on the lower table, has, for a considerable time past, been applied to timber as well as to iron, and for those who think timber sleepers better than iron, the advantages mechanical and economical, hereby attained, are very great. In the first place, as the rail is suspended by the upper table, it does not need one half the strength of the vertical web, but merely enough to hold the top and bottom tables together, as in an ordinary bridge girder. Consequently, weight can be saved in the rails, and at the same time their depth can be increased. An ordinary rail is five inches in depth, and as the strength of a beam is as the square of its depth 5×5 represent 25, whereas 6×6 represent 36, or one half increase and 7×7 represent 49 or nearly double.

In the side channels of these deep rails are bolted lateral timbers, four inches wide by four inches deep, by key bolts, three feet apart, making a total width of eleven inches. The rail is thus compounded of a central iron bar between two timber bars which give it great lateral strength in addition to its own increased vertical strength.

The lower rails are connected together at the joints by brackets of wrought angle iron, bolted down to a cross sleeper. If the rails are long, a central cross timber, four inches by four inches is secured to the central key-bolt, and thus the gauge is secured.

In the ordinary cross-sleeper road there is a sleeper every yard, the full area of which is about seven and a half superficial feet, but the practical bearing is generally calculated at less than three-fourths. On the longitudinal plan the whole area may be reckoned, and therefore the area of the suspended plan is fully equal to that of the cross-sleeper plan, while the height of the rail is only four inches above the bearing, instead of twelve inches on the ordinary method.

When this plan was first proposed it was imagined that the small bearing surface of the rail on the timber by which it was suspended would crush in and destroy the timber; but calculation easily demonstrates the contrary. For instance, there are six chairs to an 18-foot rail; the bearing of each chair on the timber sleepers is about 48 square inches—total, 288. In the suspended method there is a width of three-quarters of an inch along each side of the rail, amounting to a total of 320 square inches,—and continuous.

But, it was argued, on the Great Western system of the bridge rail there are 1,080 square inches in the same

length, and yet it crushes into the timber. Quite true, but the reason is obvious. It is a shallow and not a deep rail, and it does not distribute its load over a long space, as does the deep rail. It crushes the timber in detail beneath the wheels.

The engineer of the North London Railway had faith in the system and determined to lay down a few lengths on trial. The total width of the combined rail and lateral timbers was ten inches and a half, and the rails used were not deep, but the ordinary section of five inches—the total depth of the timbers being four inches. The rails were connected at the joints by cast-iron angle brackets secured to cross sleepers, and there was no intermediate tie, the length of rail being only fifteen feet. The result is given in the following report by the engineer:—

"The experimental length of the suspended rail laid on the North London Railway has now been down about twelve months. It was purposely placed in a situation exposed to the severest test which the line admits of, at the foot of a steep gradient, on a sharp curve, and at a station where numerous trains stop and pass through every hour.

"From the weekly reports furnished by the Company's inspectors, combined with my own occasional examination, I am able to state, with confidence, that the result of this trial has been very satisfactory in

respect of durability and of economy. The original outlay is less than that required for the ordinary modes of construction, and the cost of manufacture is trifling, while the road is smooth and easy for the traffic."

On the North London Railway engines are used of thirty-five tons weight. Passenger trains are incessant,—goods trains frequent, and with the exception that the speeds are not quite so great as on some other lines, it is one of the hardest worked lines in the world, and the use of breaks is very destructive. On the sample piece of line, the upper table of the rails being actually worn out, they were reversed, when the lower table was found as perfect as when new, and the timber was absolutely free from any wear or movement in those parts where the rail bore on it. When the bolts were taken out the timber remained fast in the recesses of the side channels, and it required force to get it out. It had become, as it were, cemented to the iron.

Since then, a portion has been laid down on the Eastern Counties line—the main line from Cambridge, near the locomotive sheds—where it has been examined by several engineers, and highly approved of. The movement is easier and smoother than on any other part of the line, though only the ordinary rails and not improved rails have been used, and the common sleepers cut down the middle have been used, instead of proper longitudinals.

We come now to the question of cost and comparison.

CROSS SLEEPER LINE. Quantities in a single mile.

		Tons. Cwt.	£	s.	£	s.	d.
504 Rails, 21 feet long	70 lbs. per yard, 5 in. deep	110 0 at say	8	0	880	0	0
504 pairs Fishes	22 lbs. per pair	4 19 "	9	0	44	11	0
2016 Bolts		1 2 "	20	0	22	0	0
3520 Cast Chairs	28 lbs. each	44 0 "	5	0	220	0	0
7040 Spikes	1 lb. each	3 3 "	12	0	37	16	0
3520 Wood Keys			5	0	18	0	0
1760 Cross Sleepers creosoted	5 in. X 10 in. X 9 ft., 4s. 6d. each..	130 0			396	0	0
18864 Parts.		293 4			1618	7	0
Freight to India at 30s. per ton					439	10	0
					£2057	17	0

SUSPENDED RAIL ON TIMBER LONGITUDINALS.

		Tons. Cwt.	£	s.	£	s.	d.	
504 Rails, 21 feet long	65 lbs. per yard, 6 in. deep	102 3 at say	8	0	817	4	0	
504 pairs Angle Joints, 1 ft. 6 in. long	28 lbs. per pair	6 6 "	9	0	56	14	0	
1008 Bolts for Angle Joints	1½ lbs. each	0 13½ "	20	0	13	10	0	
3520 Key bolts for timber	2½ lbs. each	4 0 "	12	0	48	0	0	
1008 Angle Joint Spikes	1 lb. each	0 9 "	12	0	5	8	0	
1008 Timber Longitudinals	5 in. X 4 in. X 19 ft. 6 in., 56 loads	42 0 "	3	10	Load	196	0	
252 Cross Sleepers	5 in. X 5 in. X 9 ft., 4s. 6d. each..	19 0 "	3	10	do.	56	14	0
252 Wood Ties	4 in. X 4 in. X 4 ft., 2 loads	1 12			7	0	0	
8056 Parts.		176 3½			1200	10	0	
Freight to India at 30s. per ton					264	5	3	
					£1464	15	3	

The Cross section and Plan of the suspended rail are here given. It will be seen that to remove the rail it is not necessary to remove the timber, but only the joint bolts, both sides being alike. Fig. 3 is the Cross section, Fig. 4 the Plan.

Assuming these prices to be correct, the saving on first cost by the improved system in England is per single mile £417 17 0
In India, taking the difference in freight, there is a saving of 175 4 6

Total saving..... £593 1 6
With a rail of one-half more vertical strength.*

* The timber longitudinals may be applied in shorter lengths, break-joint if preferred.

If the same principle of side bolting be adopted with Cast iron sleepers in the strongest mechanical section, as Fig. 5, the cost per mile will be—

	Tons. Cwt.	£	s.	d.
504 Rails	102 3 at 28	817	4	0
3520 Pairs cast Side Brackets	100 0 "	5	500	0
4024 Key Bolts, 3 lbs. each	5 8 "	12	64	16
504 Tie Bars, 12 lbs. each	3 14 "	12	32	8
	210 5	1414	8	6
Freight to India 30s. per ton		316	7	6
		£1729	15	6

A sample of this has been applied on the South-Western Railway.

The saving in this mode as compared with the common system will be £326 0s. 0d. Cast-iron can of

FIG. 3.

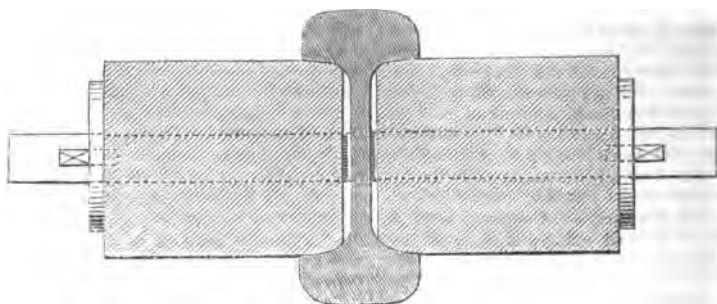


FIG. 4.

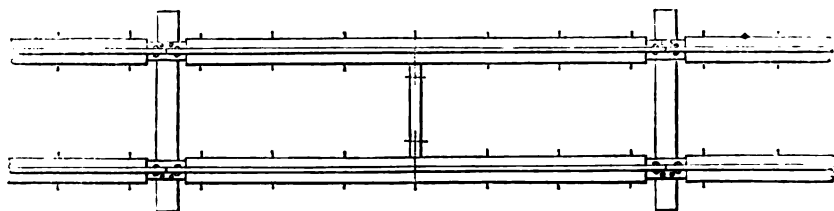
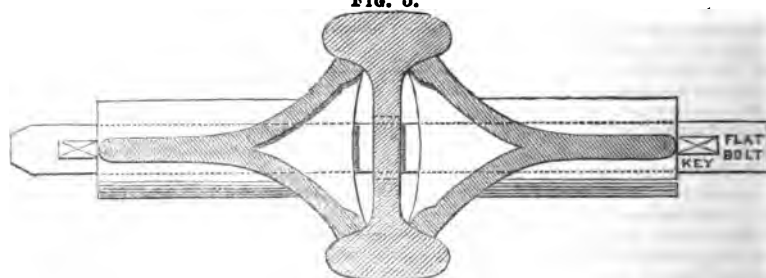


FIG. 5.



course only be used in short lengths, and not continuously like wrought iron. The minimum ultimate cost of the wrought iron way is not yet ascertained, the reduction in scantling being still in course of experiment, but enough has been shown to induce those interested to institute a very searching inquiry into the whole matter.

In using the small scantling of timber, two obvious advantages arise,—lower cost of material, and greater facility for creosoting, if that process be applied. It will bring a simpler and cheaper class of timber into use for railway sleepers. This system is really lower in cost than the American system, which has been adopted from the temporary ways of English contractors, but with the advantages of a double-headed rail of less comparative weight, but really equivalent to two rails, the lower side remaining undamaged while the upper side is wearing out. And in addition to this there is a great saving in the depth of ballast.

The prominent distinction between the American system and the English system, is, that in England a double headed rail is used, secured in a cast iron chair. The cost of these cast iron chairs, and their freight and transit rendered it necessary to dispense with them for poor lines, and in the absence of other knowledge, the double-headed rails was also dispensed with, and the flat bottomed rail of only half the service substituted for it. This new system of side bearers in the channels practically doubles the duration of the rails while diminishing the cost.

In considering the question of freight as an element in all distant Colonial lines when the material is supplied from England, India has been taken as affording the broadest comparison.

Proceedings of Institutions.

BOLTON MECHANICS' INSTITUTION.—The twenty-third annual meeting was held in the Reading-room of this Institution, on Wednesday evening, the 20th ult., where there was a respectable and moderately numerous gathering of the members and their friends. The chair was occupied by G. J. French, Esq., president; and among others present were Mr. Ald. Heywood, Dr. Chadwick, Dr. Haddock; T. Holden and A. Ferguson, Esqs. Messrs. John Entwisle, J. H. Raper, I. Barrow, W. Abbott, A. Ridings, G. Toulmin, Paul Beswick, R. Hadfield, A. Lawson, W. H. Horrocks, J. Waring, &c. The Chairman briefly opened the proceedings, and called upon Mr. Barrow, the acting secretary, to read the report which, after announcing the gratification of the Committee that the position of the Institution had improved during the past year, both numerically and financially, states that the debt upon the general account has been reduced from £54 12s. 2½d. to £35 18s. 8½d., while that incurred by the removal from Bridge-street to the present premises, which, at the last annual meeting, was

£60 5s. 1½d., is now £30 14s. 9½; so that the entire amount of encumbrance is £66 18s. 6d., which the Committee venture to anticipate may be cleared off, or, at least, very greatly reduced, by energetic and economical management throughout the ensuing year. The number of honorary members is now 98, being a decrease of two upon the preceding year. The number of general members during the past year was—in the first quarter, 320; second, 291; third, 303; fourth, 262; or an average of 294; being an increase of ten on last year. The number who have been admitted to the privileges of the Institution by the transferable cards of honorary members is 78; being an increase of 13; showing altogether a total increase of 21 persons who have participated in its advantages. The reading and news room continues as heretofore to be the most attractive and successful department of the Institution. The library has been increased by the purchase of 59, and the presentation of 19 volumes. Joseph Crook, Esq., M.P., has kindly continued his valuable contributions of Parliamentary documents, which enable the members to refer to the most recent and authentic authorities on political questions. Captain Gray, M.P., has liberally presented 100, and Peter Ainsworth, Esq., 60 copies of the Speeches and Addresses of his Royal Highness the Prince Consort. Through the kindness of F. J. Furnivall, Esq., M.A., a member of the Council of Teachers of the Working Men's College, London, the President has also been enabled to present among the committee and members 80 copies of a valuable pamphlet by John Ruskin, Esq., on the "True Functions of the Workman in Art." The number of volumes now in the library is 4,689, and the issues for the past year have been:—For the first quarter, 3,014; second, 2,867; third, 2,735; fourth, 2,401; total, 11,017; being a decrease compared with last year of 407 volumes. The following classes have been in operation during the past year. The average number of members is appended to each:—Senior writing and arithmetic, 37; junior, 52; mechanical drawing, 40; landscape, 23; French language, 9; English grammar, 8; essay and discussion, 12; total, 181; an increase of 29 over the number of pupils for the year preceding. About 20 pupils from these classes attended the annual examination held in connection with the Institutional Association, at Manchester, in June last, on which occasion the members of the mechanical drawing class succeeded in bearing away nearly one-third of the certificates awarded in that section, and one member of the arithmetic class was also successful in gaining a certificate. The Committee have abstained during the past year from all hazardous speculations for the amusement of the members, but they have had valuable assistance in gratuitous lectures, which were delivered by the Rev. R. Harries Jones, on "Landmarks of the Reign of Henry Eighth;" the Rev. Samuel Doria, of Wigan, on "The Philosophy of Education;" by the President, on "The History and Manufacture of Stained Glass Windows;" and by Henry Ashworth, Esq., three lectures, being his "Recollections of a Tour in the United States of America, Canada, and Cuba." Mr. Ashworth's lectures will be resumed in the course of the ensuing winter. The annual soirée was held in the reading-room on March 2nd, and was eminently successful. It was attended by about 260 ladies and gentlemen—the utmost number that could be accommodated in the room during tea, but his number was afterwards very greatly increased.—Mr. W. Abbott moved that the report and financial statement be adopted, printed, and circulated. This was seconded by Mr. Waring, and carried unanimously. Mr. A. Ferguson moved the thanks of the members "to those gentlemen who have aided the Institution during the past year, by donations of money or books, by the gratuitous delivery of lectures, or by giving their services as teachers of classes. Mr. John Entwistle seconded the motion; and, alluding to the teachers of the classes, especially named Mr. Paul Beswick, for the efficient manner in which he had conducted the French class. The resolu-

tion was passed unanimously, and Mr. Beswick returned thanks.—The President also acknowledged the compliment, and promised to communicate the resolution to the other gentlemen to whom it referred. Mr. Ald. Heywood said he had great pleasure in moving—"That the members hereby express to Gilbert James French, Esq., their cordial and hearty thanks for his valuable services as president of the Institution, and their desire that he will consent to retain his position for the ensuing year." Dr. Chadwick seconded the resolution, which was carried by acclamation. The President said he felt very much gratified at the kind expression of their satisfaction with his services as president during the past year. He should have been very glad indeed to have relinquished the office now; but it had been urged upon him, and there were some few reasons why he might be more useful in the coming year than one newly elected. He therefore consented to retain the office another year, with the understanding that, at the expiration thereof, he should not be asked to again accept it. He took that opportunity to inform the meeting that arrangements were in progress for a series of lectures to be delivered in that room during the ensuing winter. Mr. H. Ashworth would resume his instructive and delightful "Recollections of his Tour in the United States, Canada, and Cuba." The lectures conveyed so much agreeable information that he was sure they would look forward with pleasing anticipation to the commencement of the year, about which time Mr. Ashworth hoped to resume them. The Rev. R. Harries Jones had promised to read a paper on the "Affinity of European Languages," and Thomas Barnes, Esq., had kindly consented to give them the benefit of his practical observations gathered together during his residence in some of the principal towns of Italy during last winter. Thomas Ballantyne, Esq., proprietor and editor of the *Statesman*—a London journal, independent of any of the political parties of the day—had kindly offered to prepare and read a non-political lecture on "The best means of using a public library." Robert Heywood, Esq., one of the oldest and staunchest friends of the Institution, had promised to look over the note-books he had kept during his travels, and give such portions of them as he might think interesting and useful. Dr. Chadwick, so well known to all, whose philanthropy was equalled only by his professional skill, had been prevailed upon to promise papers on some scientific subjects of real practical interest and value. That to be first treated of was "Water, its composition and impurities." Should the members take the interest in this and kindred subjects of physical science which their importance deserved, he hoped that Dr. Chadwick might be induced to extend his papers to other branches of domestic and household science. The Rev. H. Powell, vicar of Bolton, promised to deliver a lecture on his "Personal recollections of the Island of Ceylon, its natural productions, agriculture, inhabitants, religion, &c." For his own part, if agreeable to them, he proposed to read something about the life and times of the late Samuel Crompton, a Bolton worthy, less known than he ought to be to the present generation of his townsmen. He was not without hope that other gentlemen might be induced to give similar aid to the Institution, and also that a system of exchanging lectures with some of the Institutions in neighbouring towns might eventually be arranged, by which they might be able reciprocally to benefit each other. All, however, depended on the reception given to the lectures by the members. Hitherto it had been the custom to invite the general public to attend lectures and entertainments got up by this Institution, charging a small sum for the admission of such persons as were not members. No practical advantage had been derived from this arrangement, the receipts being usually so small as to be unworthy of notice; while there was a difficulty at a crowded meeting in knowing who were and who were not members. It was therefore suggested whether it might not be better to confine the admission to the lectures of the ensuing season to the

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NOTES FOR THE ENSUING WEEK.

- ... Architects, &c.
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NEW LAW AMENDMENT ACT.

... PATENTS AND PROTECTION ALLOWED.

London Gazette, Nov. 5, 1858.

Dated 27th September, 1858.

... An improved neck cloth in the shape of
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Dated 19th October, 1858.

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2344. T. Twells, Nottingham—Imp. in machinery for embroidering or ornamenting woven, looped, or laced fabrics.
2345. J. Wainwright, Birkenhead—Imp. in ventilating houses and other places.
2346. S. T. Clark, 30, Kildare-terrace, Westbourne-park—Imp. in apparatus for crossing bankers' cheques and drafts.
Dated 21st October, 1858.
2347. C. C. Alger, Parliament-street, Westminster—Imp. in cupola furnaces.
2348. J. Marland and S. Marland, Sun Vale Iron Works, Walsden, Lancashire—Certain Imp. in power looms.
2349. P. Clerc and A. Piaget, 4, Newcastle-place, Clerkenwell—An improved method of winding watches, chronometers, and time-pieces, without the use of a separate key.
2351. J. M. Napier, York-road, Lambeth—Imp. in printing presses and printing machines.
2353. G. Redford, Moseley, Worcestershire—A circular and self-acting cartridge pouch.
2354. J. Baldwin, jun., Birmingham—Imp. in files or holders for papers, letters, bags, and other similar articles.
2355. R. A. Brooman, 166, Fleet-street—Imp. in knitting frames. (A com.)
2356. R. A. Brooman, 166, Fleet-street—Imp. in apparatuses for regulating the supply of fluids. (A com.)
2357. R. A. Brooman, 166, Fleet-street—Imp. in cocks, taps, and other apparatuses for regulating the flow of fluids. (A com.)
2358. J. H. Johnson, 47, Lincoln's-fields—Imp. in apparatus for lubricating railway axles and other bearings. (A com.)
Dated 21st October, 1858.
2359. J. Burridge, 151, Great Portland-street—Imp. in fire-lighters.
2361. J. Bagnall and W. Bagnall, Westbromwich, Staffordshire—An Imp. in the manufacture of iron.
2362. A. Shaw, The Earle's Field Works, Grantham, Lincolnshire—A new method or mode of raising nap on the linings of sheep skins.
2363. R. Waller, 50, Baker-street, Portman-square—Imp. in obtaining motive power, and in apparatus connected therewith.
2364. R. Kennedy and J. Armstrong, Lisburn, Ireland—An improved kiln for drying grain.
2365. C. Clay, Walton-grange, Wakefield—Imp. in apparatus for hawthorn, scarifying, and cultivating land.
Dated 23rd October, 1858.
2366. Edwin Palmer and Edward Palmer, Thetford—Imp. in machinery or apparatus for cutting hay, straw, or other similar substances.
2367. P. C. Stortz, Havelock-buildings, Bold-street, Liverpool—An imp. for taking life-size pictures from smaller pictures, either with or without the aid of photography.
2368. E. C. Shepard, Jermyn-street, Westminster—Imp. in electric lamps. (A com.)
2369. R. Bodmer, 2, Thavies-inn, Holborn—An improved toy or plaything for children. (A com.)
2370. G. Davies, 1, Serle-street, Lincoln's-inn—Imp. in weaving. (A com.)
2371. J. C. Martin, Fern-cottage, Charlewood-road, Putney—An imp. in the manufacture of metal moulds for moulding plastic substances.
2372. W. E. Newton, 66, Chancery-lane—Imp. in pumps. (A com.)
2373. W. E. Newton, 66, Chancery-lane—Imp. in telegraphic apparatus. (A com.)
Dated 25th October, 1858.
2374. E. Cottam, Lower Belgrave-place, Pimlico—Imp. in the internal fittings of carriages.
2375. M. Mason, Manchester—Imp. in elevating stands or stages for the use of hosemen in extinguishing fires, also for decorating windows, public buildings, and other purposes.

2376. J. J. Welch and J. S. Margetson, Cheapside—Imp. in the manufacture of scarfs for gentlemen's wear.
2377. Capt. Fowke, R.E., Park-house, South Kensington—Imp. in umbrellas and parasols.
2378. J. Robb, Aberdeen—Imp. in propellers for ships and boats.
2379. T. Ashworth and J. Ashworth, Fendleton, Lancashire—Certain Imp. in power-looms for weaving.
2380. W. Craddock and J. White, Archer-street, Saint James's—Imp. in the connecting links of harness hames.
2381. G. Kent, High Holborn—An improved churn. (A com.)
2382. A. V. Newton, 66, Chancery-lane—An imp. in the manufacture of candles. (A com.)
2383. S. R. Parkhurst, New York, U.S.—Imp. in cotton gins.
Dated 26th October, 1858.
2384. M. Mason, Manchester—Imp. in self-acting feeding machines, or apparatus for all descriptions of steam or other letter-press printing machines or presses.
2386. C. Wieland, Warkworth-terrace, Commercial-road, Limehouse—Certain imp. in chronometers, watches, and such like timekeepers.

WEEKLY LIST OF PATENTS SEALED.

[From Gazette, Nov. 5, 1858.]

- | November 5th. | | November 5th. | |
|---------------------------------------|--------------------|---|-----------------|
| 1005. J. S. Willway. | 1007. W. Hoop. | 1195. V. L. Vodor. | 1293. D. Irons. |
| 1008. E. J. Scott. | 1009. H. Ashworth. | 1313. T. W. Mellor and W. Jamieson. | |
| 1015. J. Wright. | 1024. J. J. Field. | 1441. H. W. Wimbhurst. | |
| 1033. J. T. Robson. | 1041. W. H. Ogden. | 1887. W. Warne. | |
| 1145. F. G. Underhay and J. L. Clark. | 1193. C. Cowper. | 2007. W. P. Piggott and S. Beardmore. | |
| | | 2013. S. Hogg, W. P. Piggott, and S. Beardmore. | |
| | | 2023. W. Tucker. | |
| | | 2087. A. H. J. Bastable. | |

[From Gazette, Nov. 9, 1858.]

- | November 9th. | | November 9th. | |
|---------------------|-------------------------------|----------------------------------|--------------------------------------|
| 1046. W. G. Taylor. | 1047. J. B. Pim and C. Payne. | 1071. R. Knight. | 1075. W. S. Bailey and W. H. Bailey. |
| 1052. E. Fairburn. | 1053. J. Soutter. | 1079. A. M. Dix. | 1090. J. Macintosh. |
| 1055. A. Parkes. | 1066. A. Parkes. | 1199. C. Stanley and J. Fittall. | 1463. J. Shaw. |
| 1063. L. Durand. | 1064. M. Dooey. | 1444. J. Shaw. | 2085. G. C. Grimes. |
| 1066. J. A. Clarke. | | 2098. J. R. Scartiff. | |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[From Gazette, Nov. 5, 1858.]

- | November 1st. | | November 5th. | |
|------------------------|---------------------|----------------------------|---------------|
| 2450. J. Patterson. | 2456. W. Gardner. | 2552. J. Homan. | November 3rd. |
| 2486. A. C. L. Devaux. | 2532. A. V. Newton. | 2487. R. A. Brooman. | |
| | | 2509. W. Lund and A. Bain. | |

[From Gazette, Nov. 9, 1858.]

- | November 4th. | | November 6th. | |
|-----------------------------------|--|--------------------------------------|--|
| 2561. J. Burrows. | | 2503. W. Davis. | |
| | | 2504. Louis Benoit Advielle. | |
| | | 2512. H. J. Benjamann. | |
| 2492. R. Threlfall and J. Higson. | | 2597. G. Collier and J. W. Crossley. | |

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4131	November 4.	Well Bucket	Edward P. Capper	{ West Maitland, New South Wales, Australia.

LIST OF PRESENTS.

The following presents have been made to the Society during the past year. The thanks of the Society have been forwarded to the donors.

PRESENTS.	DONORS.	PRESENTS.	DONORS.
Specifications of Patents up to the present time, and Indexes	Commissioners of Patents.	Report of Experiments with Small Arms for the Military Service, by Officers of the Ordnance Department of the U.S. Army	"
Abridgments of ditto	"	An Account of the Smithsonian Institution: its Founder, Building, Operations, &c.	W. J. Rhess.
Commissioner of Patents' Journal ..	"	Journal of the Agricultural and Horticultural Society of India, Vol. ix., part 3	Society.
Synopsis of the Patent Laws of various Countries, by Alexander Tolhausen, Ph. D.	The Author.	Proceedings of the Royal Geographical Society, Vol. i., Vol. ii., parts 1, 2, 3, 4, 5	"
Memoirs of the American Academy of Arts and Sciences, Vol. vi.	Academy.	A new system of Chemical Philosophy, Part 2, 1810, by Dalton Do. do., Vol. ii., part 1, 1827, by Dalton	Manchester Literary and Philosophical Society.
Proceedings of ditto, pp. 185-248 ...	"	Do. do., Part 1, 1842, by Dalton.. Dalton's Meteorology (2nd Edition), 1884	
Transactions of the American Philosophical Society, Vol. ii., p. 1 ...	Society.	Memoirs of the Literary and Philosophical Society, Manchester, Vol. xiv.	Society.
Proceedings of ditto, Vol. vi., No. 56	"	Manual of Arithmetic, by Rev. J. Galbraith and Rev. S. Haughton..	The Author.
Transactions of the Academy of Science of St. Louis, Vol. i.	Academy.	Do. Plane Trigonometry, by do. do.	"
Report upon Public Schools and Education in Rhode Island, U.S.	E. R. Potter.	Do. Euclid, by do. do.	"
Proceedings of the Academy of Natural Sciences of Philadelphia for 1857	Academy.	Do. Mechanics, by do. do.	"
History of Wisconsin, by W. R. Smith, Wisconsin	Wisconsin Historical Society.	Do. Hydrostatics, by do. do.	"
1st and 2nd Annual Report of the Wisconsin Historical Society	"	Do. Optics, by do. do.	"
Maddison, Wisconsin: its Growth, Progress, Condition, Wants, and Capabilities, by Lyman C. Draper (4 copies, with maps)	"	Do. Astronomy, by do. do.	"
Annual Report of the Geological Survey of Wisconsin, by J. G. Percival	"	Civil Service Competitions considered as a means of promoting Popular Education, by Horace Mann	The Author.
City of Waterton, Wisconsin: its Manufacturing and Railroad Advantages, &c.	"	Antimonium en Platina van Borneo, onderzocht en Beschreven, door Prof. S. Bleekrode	"
United States Patent Office Reports for 1855. Mechanics, 2 vols.; Agriculture, 1 vol.	U.S. Patent Office.	Transactions of the Silesian Society for 1856	B. Hebel.
Barnard's American Journal of Education, Vol. i., 1856	Hon. H. Barnard.	Report of Council of Art Union for 1857	Art Union.
Messages from the President of the U.S. to the two Houses of Congress, at the commencement of the 3rd session of the 34th Congress, Parts 1 & 2	Smithsonian Institution, U.S.	Journal of the Royal Dublin Society, Nos. 4, 5, 6; Vol. i.	Society.
The Reports of the Secretary of the U.S. Treasury on the state of the Finances for 1855-6.	"	Transactions of the Historic Society of Lancashire and Cheshire, Vol. ix., 1856-7	"
Do. do. Commerce and Navigation of the U.S.	"	Journal of the Statistical Society of London, Vol. xx., part 4; Vol. xxi., parts 1, 2, 3	"
The Report of the Superintendent of the U.S. Coast Survey for 1855...	"	The Cotton Trade; two Lectures, by Alderman Baynes	The Author.
Smithsonian Contributions to Knowledge, Vol. ix.	"	Brief Extracts from Memoranda of the Earl of Dundonald	Earl of Dundonald.
Annual Reports of the Board of Regents of the Smithsonian 1855-6	"	Colonization, Defence, and Railways in our Indian Empire, by Hyde Clarke	The Author.

PRESENTS.	DONORS.	PRESENTS.	DONORS.
Ornamental Drawing and Architectural Design, by R. Scott Burn...	"	The Geologist, Vol. i., Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.....	T. A. Readwin.
De Surinaamische Geta Pertaja, door Prof. S. Bleekrode	"	On the Rapid Transmission of Troops to India, &c., by Capt. Hoseason; 8 copies	The Author.
Study of Living Languages, by Col. Arthur Cotton	"	Reviews of the Measures which have been Adopted in India for the Improved Culture of Cotton, by Dr. Forbes Royle.....	Mrs. Royle.
Histoire d'une Bulle de Gaz, par M. Jobard	"	Transactions of the Royal Scottish Society of Arts, Vol. v., part 1 ...	Society.
American Journal of Science and Art, September, 1857	Montreal Natural History Society.	The Student's Blackstone, by Kerr Catalogue of the Antiquities of Stone, Earthen, and Vegetable Materials in the Museum of the Royal Irish Academy	John Murray.
Canadian Naturalist and Geologist, Vol. ii., No. 4; Vol. iii., Nos. 1, 2, 3.....	Society.	Observations on the Recent Addition of a Reading Room to the British Museum	Academy.
Journal of the Dublin Geological Society, Vol. vii., part 5; Vol. viii., part 1	"	Memoirs of the Royal Astronomical Society	Wm. Hosking.
Canadian Journal, Nos. 12, 13, 14, 15, & 16	Life Boat Inst. The Director.	Paper on the Bhore Ghaut Railway Incline	Society.
Transactions of the Linnæan Society, Vol. xxii., part 2	Academy.	Three copies of Third Report of H.M. Civil Service Commissioners	J. J. Berkley.
The Life Boat, Nos. 1 to 29	The Editors.	Two copies of Twenty-fifth Annual Report of the Sacred Harmonic Society	C.S. Commissioners
The "Bauhütte," 12 Nos.	Society.	Five copies of the History, Cultivation, Composition, and Feeding Properties of the Mangold Wurzel	Society.
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ERRATA.

Page 162, col. 1, line 56, for "Guilt" read "Guilt;" and for "315" read "316."	Page 206, col. 1, line 16, for "Niele" read "Wiele."
" 162, col. 2, line 40, for "waste" read "water."	" 541, col. 2, line 45, for "Polynimials" read "Polynomials."
" 163, col. 2, line 13, for "752" read "52."	" 684, col. 2, line 46, for "70" read "735."
	" 684, col. 2, line 46, for "50" read "506."

Society for the Encouragement of Arts, Manufactures, and Commerce.

ADELPHI, LONDON.

ON -HUNDRED-AND-FOURTH SESSION, 1857-58.

C A T A L O G U E

OF THE

TENTH EXHIBITION OF INVENTIONS.

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1858.

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CATALOGUE

OF THE

TENTH EXHIBITION OF INVENTIONS,

BEING A COLLECTION OF ARTICLES RECENTLY INVENTED, PATENTED, OR REGISTERED,
EXHIBITED AT THE SOCIETY'S HOUSE DURING THE SPRING OF 1858.

N.B.—The Council wish it to be understood that they are not responsible for any of the statements contained in this Catalogue.

ENGINEERING, MINING, RAILWAY MECHANISM, &c.

(For the remainder of the Articles in this Section, see Drawings.)

1. Patent Reciprocating Furnace Bars; John Chanter, Bromley St. Leonard's, Bow-road, E.

These bars are moved to and fro by a hand lever, fixed to a rocker, which cleans the entire surface of the grate without opening the furnace door. The bars are made in both single and double lengths, as shown in the accompanying

illustration of a furnace fitted with the latter kind. The dead plate is formed with slots or openings, which, upon the bars being worked backwards and forwards, are opened and closed, thus giving a sufficient supply of air to the furnace, at the moment the coals are temporarily disturbed for clearing the grate, so as to cause perfect combustion, and prevent smoke.

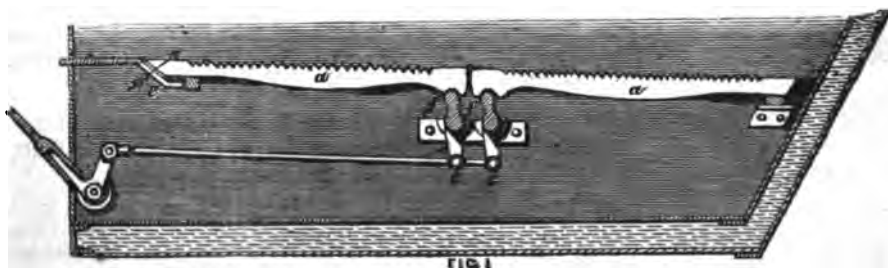


FIG. 1

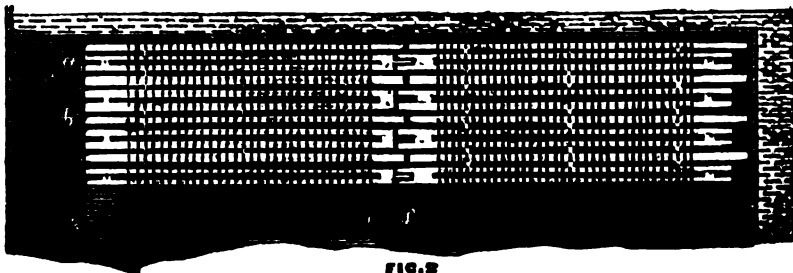
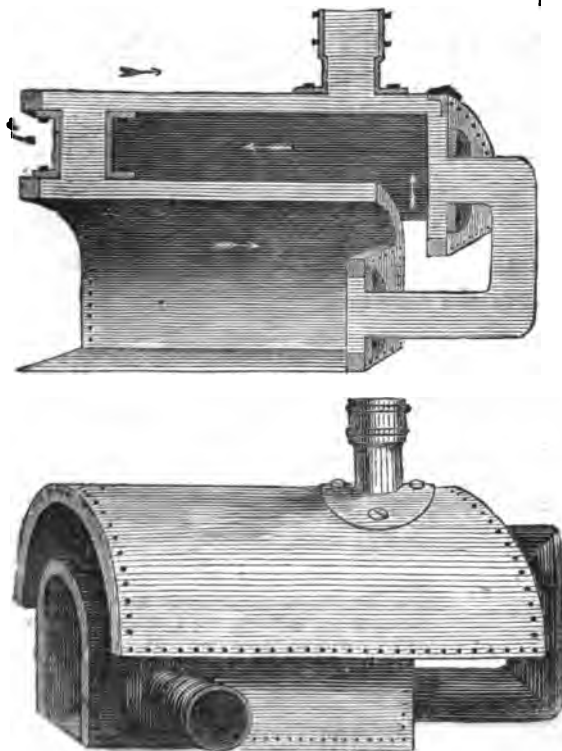


FIG. 2

2. Patent Double-backed Double Boiler; G. and W. Steell, Richmond, Surrey, S.W.

This boiler is formed of two half cylinders, with backs, the top one being longer than the bottom one, and so much larger as to leave a flue between the cylinders; the first cylinder contains the fire, which plays on the back of the bottom part of the boiler, after which it acts on the back of the second, and passes through between the cylinders and returns over the top, by which time the heat is totally exhausted. The two cylinders are attached by the pipe in front between the two, and the backs by a pipe which joins them together, giving all the circulation possible. The socket flange on the top is for the flow, and those at the sides for the return.



3. Steam Boiler; Taylor and Rolfe, Northill, Bedfordshire.

This boiler has a water chamber within the capacity of the flue, and communicating with the outer boiler by means of pipes, extending from the bridge backwards, concentric with the flue, with space all round for the products of combustion. It may be cylindrical or annular, with flue passage through it, or it may be multitubular. The furnace bar frame is hollow, slides in from the front, communicates with the boiler, and is in a piece with the bridge, which is also hollow; the bars are also hollow, and connect the furnace bar frame with the bridge. The water circulates through these hollow parts freely. (See the *Engineer*, Sept. 25th, and Oct. 23rd, 1857.)

4. Patent Feed-water Heater for Steam Boilers;

John Randolph Sees, New York. Exhibited by Davies and Hunt, 1, Serle-street, Lincoln's-inn, W.C., and Glasgow.

The feed-water passes through a coil of pipe placed in the breeching or in the smoke box of the boiler, and thus becomes heated; this is stated to effect a saving of 25 per cent. in fuel. There is a check-valve which allows of the circulation being kept up when the feed-pump is not at work.

5. Improved Copper Circulating Tubular Boiler; C. Askew, 27½, Charles-street, Hampstead-road, N.W.

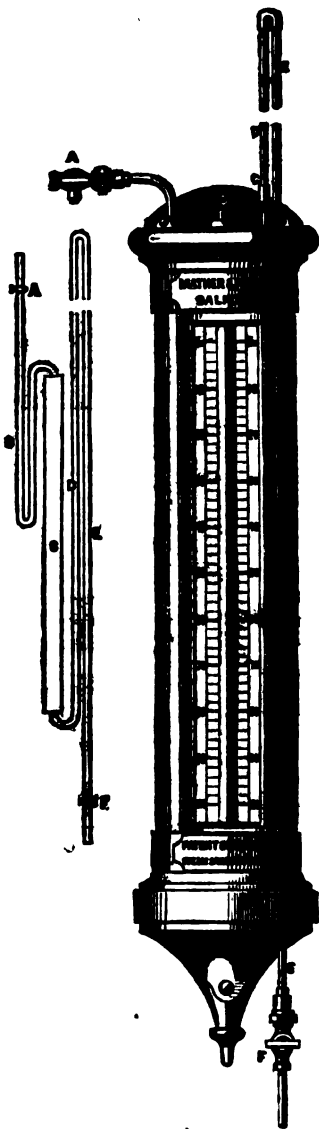
6. Safety Apparatus for Steam Boilers; W. Mann, City of London Gas Light and Coke Company, Dorset-street, Salisbury-square, E.C.

The object of this invention is to modify the arrangement of the ordinary high and low-water guage cocks in such a manner as to keep a constant check upon the person in charge of the boilers, and to cause at intervals, say of half an hour, a pointer to indicate whether the cocks have or have not been examined at such intervals. The guage cocks (in this case three) are connected by a pipe, the upper end of which leads to the pressure cylinder of the registering apparatus containing a piston and spring, which spring only allows the piston to move in proportion to the pressure it receives from the steam: consequently the point of the pencil or tracer is preserved at a distance from zero corresponding to the number of pounds pressure, until the stoker uses the guage cocks to ascertain the quantity of water in the boiler; he commences by shutting off the upper one of the three, and opening the discharge cock on the lower end of the pipe; this allows the steam contained therein to rush out, and the spring to return the piston to a position that brings the pencil to zero. After the stoker has satisfied himself that the quantity of water is sufficient, he shuts the discharge cock, opens the upper one, and the pencil returns to the line of pressure as before: his attention to the same being recorded at the time by the radial line drawn by the pencil.

7. Patent Mercurial Compound Steam and Vacuum Guage; Mather and Platt, Salford Iron Works, Manchester.

In this guage the mercury in the glass tube balances the mercury in the rising column when the pressure is on. One characteristic of this invention is, that it is self-detecting of its own accuracy at any moment it is desired to test it. Thus, suppose the steam-tap open, the pressure indicated 30lbs.; close the steam-tap, and the mercury will at once rise to zero; if not, the difference is at once seen. Now open the tap leading to the condenser, and you get the vacuum in lbs.,—say 13lbs. Now open the steam-tap, and you will have indicated 43lbs.—30lbs. steam, and 13lbs. vacuum. By this means the number of horse-power might be shown on the scale of the guage, where the speed of the engine is uniform and the area of cylin-

der calculated for, if the steam be taken between the throttle valve and cylinder.



(A) Steam inlet three-way tap. (B) A small syphon to contain water to prevent steam coming in direct contact with the glass tube (C). (D) the rising column for the mercury to ascend as the pressure increases (this column must be 2 inches long for each pound pressure). (E) Tube leading from the top of the column to the condenser. (F) A three-way tap, so that when it is closed to the condenser it may be open to the atmosphere to allow a balance of mercury.

8. Pressure Gauge ; J. Allen, Boston, U.S.A.
Exhibited by W. and J. H. Johnson, 47, Edinboro's-fields, W.C., and Glasgow.

The peculiarities of this gauge are the combination of a piston and flexible diaphragm, with a bow or hoop spring and rack and pinion; the

use of a cup-shaped flexible diaphragm, contained within a spheroidal chamber for giving motion to the indicator, and the use for the same purpose of a helical spring, of a dome or cup shape, in combination with a capsule of vulcanized india-rubber. These gauges may be applied either as vacuum or pressure gauges.

9. Hot or Cold Blast Indicator or Pressure Gauge ; Joseph Cadman, Bridgend, Glamorganshire.

This instrument is intended to indicate the blast at the furnace tuyere, as well as the loss from leakage, &c., in the air pipes. This is effected by a valve in connection with a steel-yard, graduated and weighted in the usual manner.

10. Blast Whistle with Weights ; Joseph Cadman.

In this instrument the weights on the valve stem represent the lbs. pressure, or pillar of blast required by the manager, and the whistle is so arranged as to sound the alarm only when the blast is less than the required pressure, and thereby becomes a tell-tale against the engineer.

11. Improved Steam Engine Governor ; Brown and May, North Wilts Foundry, Devizes.

12. Metal Steam Cocks, Whistles, Water Gauges, and other Cocks, with recent improvements in construction. Perreaux and Co., 39, Mark-lane, E.C., and T. Suffield and Co., Bermondsey-wall, S.E.

13. Patent Self-acting Safety Valve and Spigot. Daniel D. Daly, Tuckey-street, Cork.

This valve consists of a cylindrical flanged cap, the bottom of which serves as the seat of the valve, which is pressed into its place by a spiral spring fitting round the stem and forced downward by a cap screwed into the upper end of the cylinder, having two small holes bored through it. The stem of the valve rises above this cap, and has an eyelet hole to admit the end of a lever for the purpose of raising the valve externally to admit air.

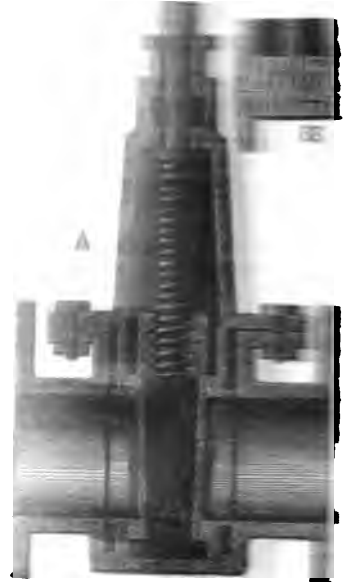
14. Slide Valve ; W. E. Ellis, Vulcan Foundry, Warrington.

Valves are placed between the steam and exhaust ports in this slide valve, which are worked by the admission of the steam by the slider. In consequence of this there is no premature compression or exhaustion, however great the lap may be, and the exhaust is thrown fully open at once.

15. Patent Sluice Valve ; Brown and May, North Wilts Foundry, Devizes.

This sluice cock is opened by a bevel pinion working into a toothed rack, cast on the back of the sluice, and is constructed so that one turn of the spindle will completely open it. When closed, the faces (either brass or iron)

Slide Valve; Charles Bottin and
Lawford - passage, Ray-street, Ont.
E.C.

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— FRANK and Co., 39, Mark-lane, E.C.

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These valves are constructed entirely of India Rubber, vulcanized for the purpose, and take the form of a tube flattened at one extremity, something similar to the mouth-piece of a hautbois, and approaching as nearly as possible in form and action the valves contained in the human heart. The thickness of the sides of the upper part diminishes gradually to the top, where the two sides meet and form lips, which, when the valve is in a state of rest, are in close contact, and prevent the downward passage of the fluid. With any upward pressure the lips freely separate and allow of the upward passage of the fluid. The gradual tapering of the sides forming the lips of the passage, enables the valve to open and close with the slightest variation of pressure, and, by properly proportioning, to resist any required amount of downward pressure. The passage for the fluid is larger in these valves than in any others of equal dimensions; They also possess the advantage of having a "clear way," there being nothing to retard the passage of water, and owing to the self-acting principle imparted by the elasticity of the material, they close perfectly and instantaneously the moment the pressure from below ceases.

22. Patent Rotary Engine ; Carl Heinrich Schroder, Altona, Duchy of Holstein. Exhibited by Davies and Hunt.

The principal novelty in this invention consists in placing the cylinder or steam space (in which the piston and shaft revolve) with its axis at an angle of more or less inclination to the axis of the shaft and piston, instead of their axes being coincident, as is usually the case; the said steam space being divided into two equal parts in a diagonal direction, by means of a circular disc placed at right angles to the axis of the shaft, and provided with an opening through which a solid piston fitting the steam space works. The engine may be arranged so that the cylinder may be stationary, with the disc attached to the shaft, which passes through stuffing boxes placed at an angle with the axis of the cylinder, in which case the piston moves round the shaft with the disc; or the cylinder and disc may both be stationary, in which instance the interior of the cylinder must be spherical and divided into two hemispherical spaces by means of the disc, and two circular blocks are to be placed upon the shaft, one in each space, in such a manner as that their axes shall coincide, and shall cross the axis of the shaft at an angle passing through the centre of the sphere. In this case, although the interior of the cylinder is spherical, yet the steam space revolves as it were upon an axis diagonal to the axis of the shaft. A modification of this arrangement may be made wherein the whole of the engine and cylinder revolve together. In this latter case the interior of the cylinder is spherical, and the two circular blocks with a fixed piston or steam stop between them are placed upon and revolve round the axis of the shaft, whilst the cylinder and disc revolve round an axis which crosses that of the shaft at an angle passing through the centre of the sphere.

23. Improved-Double Action Ships' Pumps; T. Suffield and Co., 13, Bermondsey-wall, S.E. and Perreaux and Co., 39, Mark-lane, E.C.

These pumps are fitted with Perreaux' valves, above described. The valves will pass with ease any foreign substance that may enter the suction pipe, and are not affected by being out of use for a considerable time. The arrangement of these pumps affords facilities for cleansing the suction pipes, and examining the valves, and they are so constructed that a pair of common main or bilge pumps can be connected in a few minutes into a powerful fire pump.

24. Single Action Ships' Pump; T. Suffield and Co., and Perreaux and Co.

This pump is on the same principle as the foregoing.

25. Murray's Patent Improved Pump. Exhibited by Thos. Middleton, Engineer, Loman-street, Southwark, S.E.

In this pump the lifts are joined to the chains at right angles, and allow them to pass over a small-tooth pulley at the top and a bend at the bottom, so as to feather the lifts on the return side. This pump is not liable to be choked, as any foreign substance getting between the lift and the barrel would, by a partial back-turn of the chain, be immediately released, the lift folding up, and letting the substance free.

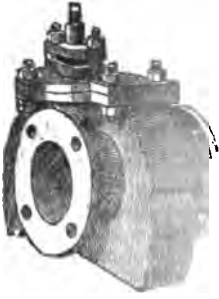
26. Patent Oscillating Pumps; David Falconer, 68, Causeyside-street, Paisley.

The chief feature in these pumps is the flexible chambers of leather or India-rubber. In each chamber there is a valve opening inwards, and communicating with the pipes which descend into the fluid to be raised. A forked pipe is connected with the top of each flexible chamber, having a valve opening upwards, which allows the pressure to act through the pipes, and the fluid to be raised to its required height. The specimens shown illustrate the application of the principle to house, garden, and agricultural purposes.

27. New Fire-engine. Exhibited by L. de Fontainemoreau, 4, South-street, Finsbury, E.C.

This fire-engine is composed of two cylinders, in which are two pistons attached to a piston rod. The upper piston works in the inner cylinder, and the lower piston, furnished with a valve opening upwards, works in the outer cylinder. Between the two pistons is an air vessel open at the bottom, and attached to the piston-rod. On the ascent of the two pistons the lower one forms a vacuum, which draws the water from the reservoir into the outer cylinder, through a valve placed at its lower part. Half of the water in the cylinder is thus forced out of the delivery pipe, whilst the other half follows the ascent of the upper piston. When the two pistons descend, the valve at the bottom of the outer cylinder closes, and the valve of the lower piston opens. During this time the upper piston, performing its stroke, forces the water back into the delivery pipe. A small tube placed under the valve at the bottom of the cylinder, allows a small quantity of air to enter the air vessel between the two pistons on the ascent of the latter. The air becoming compressed, enables a regular and unintermittent flow

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falls from this shoot in a broad thin shower, a current of air passing to the fan removes the fine light dust, which would, if allowed to enter the water separator, absorb too much water. As shale is specifically heavier than coal, and is not so friable, the fine dust thus separated by air is almost perfectly pure coal. The rest of the coal falls into one side of the separator marked rough coal, where vertical currents or pulsations of water are driven up through it by the piston and its valves, which open downwards. As the coal and shale rise and fall by this current of water, they slide up and down against a perforated division of the separator, and the finer particles pass through the holes into a second division, where the current of water is more gentle and regulated to the finer particles by the current regulator or shutter. The shale settles to the bottom of the separator, and passes through valves into the shale box, out of which it can be removed in a continuous stream by a small dredger (not shown in the model). The pure coal remains at the top of the separator, and is carried forward by the blades or rakes attached to the perforated wire endless band. These blades raise the coal out of the water in order to let the latter drain off, and then discharge it down a shoot into a train placed to receive it. As the purified coal descends the shoot, the fine dry coal dust before mentioned is driven on to it by the fan in a continuous shower, and the percentage of moisture in the whole mass is small. The water flows upwards through the wire gauge which acts as a filter to keep back the coal, but it does not get clogged as it is in motion, and a fresh surface is continually presented. The filtered water flows back by a side channel on to the piston, so that there is no waste of water. The endless wire band presses on longitudinal brushes,

which prevent the water passing from one compartment to another, except through the wire filter. The machine is nearly automatic, feeds itself, and delivers its purified coal into one train, and its shale and pyrites into another. The attention of the man working it has to be simply directed to prevent too much shale collecting in the separator and passing over with the coal. This he regulates by opening the shale more or less. The machine divides the coal into three parts, and, after separating the particles according to specific gravity, reunites them. There is no water or coal wasted. The cost of separating coal from its impurities, by this machine, is from 2d. to 3d. per ton, including all expenses of engine power, attendance, &c.

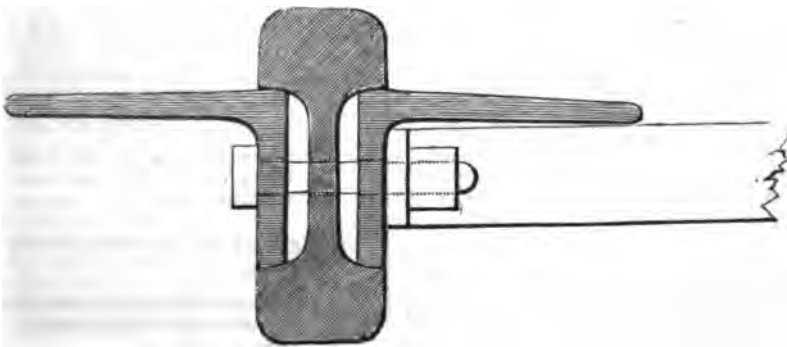
33. Specimen of Shale Ironstone; Herbert Mackworth.

34. Specimens of Iron Slags; Herbert Mackworth.

35. Improved Trap Door for Mines and Collieries; Robert Rennie, Netherwood, near Cumbernauld, Dumbartonshire.

This door is connected with a lever, which may be either vertical or horizontal, the connection being made by means of an endless wire-rope, or by tie-rods. This lever is acted upon by the waggon, and opens the door, allowing the waggon to pass through; a second lever on the other side of the door closes it in a similar manner. The models show the two different arrangements.

36. Patent Suspended Girder Rail; W. Bridges Adams, 1, Adam-street, Adelphi.



This rail is arranged to remedy the defects in the ordinary arrangement. In the double-headed rail, as applied on the London and North Western Railway—the whole is of wrought iron, in four types or parts—the rail which may be single or double-headed; the angle bracket; the belt; the tie or guage-bar, the length of which determines the gauge. The rail is 7 inches in depth; the angle-brackets spread to a width of 18 inches, and each joint, whether of rail or bracket, is intersected by two solids, and the tread of the rail is only 2½ inches

above the bearing surface on the ballast, being equivalent, in bearing area, to a cross sleeper-road, with the sleepers spaced 2 feet 6 inches apart. Thus the rail, 7 inches deep, has nearly twice the vertical strength of the common rail, the squares of the depths being as 49 to 25; the horizontal strength, by reason of the angle-brackets, is increased manifold. This rail being double-headed, and not liable to damage by being placed on chairs, it may be turned upside down and end for end. The specimen shown is produced by the Ebbw Vale Company.

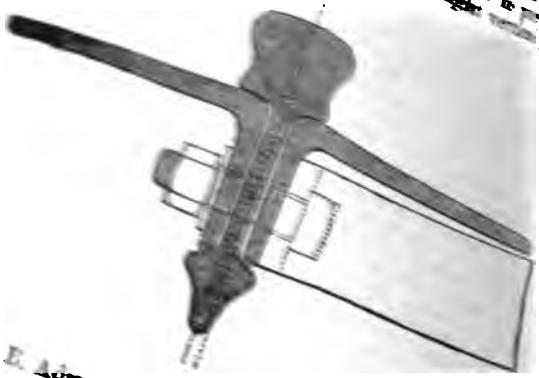
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SECTION OF AIR PIPE
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The air pipe is made of iron or steel, and is of a diameter of 12 inches. It is divided into two parts, the upper part being 12 feet long, and the lower part being 12 feet long. The upper part is divided into four sections, each 3 feet long, and the lower part is divided into four sections, each 3 feet long. The sections are connected by flanges, and the whole is supported by a central column. The air pipe is used for the purpose of ventilating the engine room, and is connected to the main air pipe by a valve. The air pipe is also connected to the main air pipe by a valve, and the whole is supported by a central column. The air pipe is used for the purpose of ventilating the engine room, and is connected to the main air pipe by a valve. The air pipe is also connected to the main air pipe by a valve, and the whole is supported by a central column.



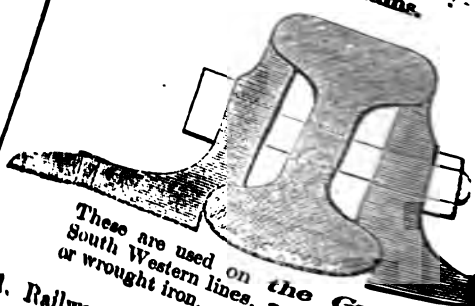
Improved Fish Joint; W. E. Adams



This joint is joined by stamping the rail-ends into square channels, in which ribbed flanges of great lateral strength are formed. The bolts and nuts are secured to key fast against the rails.

These are used on the Great Eastern Railway, and may be used on any other line.

42. Bracket Joint for ordinary Rails; W. B. Adams



These are used on the Great Eastern Railway, and may be used on any other line.

41. Railway Bridge of Small Span: W. B. Adams

This shows the double-headed girder, supported by two rails bolted together, and completes the whole bridge structure, including the whole bridge structure, and only requires to be laid on the abutments of stone or timber on either side of the opening.

43. Patent Wrought-iron Railway Chair; Robert Monte, 65, Old Broad-street, C.

This invention consists in holding the rails in position by two pieces of such a form as to embrace the rail, and the whole of the chair may be secured to the ends of the rail on either side, the whole being secured by a bolt or nut.

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two portions of the chair being bolted together through the middle portion of the rail.

43. Patent Railway Chair; R. J. Badge, Manchester.

This chair is constructed in two pieces, having the joint under the rail. The rails are fixed to the chairs by screw bolts running through them. (See Drawing, No. 322.)

44. Patent Cotter-joint Chair; R. Taylor and R. Worswick, Ipswich, and J. Lovatt, Sudbury.

The principal peculiarity of this joint is that the cotter passing transversely through the chair and slots in the ends of the rails, holds the rails firmly on the bottom or bearing surface of the chair, so that they do not depend on side keys or wedges to prevent their rising. This prevents the rails sliding or creeping through the chair, at the same time allowing sufficient freedom for expansion or contraction on change of temperature. The wood keys press the rails to the side of the chair, thus ensuring an even joint both on the surface and edge. (See *Practical Mechanics' Journal* for January, 1868.)

45. Patent Cotter Joint Clutch, for suspended joints in rails; R. Taylor and R. Worswick, and J. Lovatt.

The principal peculiarity of this joint is that the cotter passing transversely through the clutch and beneath the ends of the rails, prevents vertical play, whilst there is sufficient freedom for expansion or contraction. The bolts through the lip and rails serve to keep the rails fair on the edge.

46. Patent Railway Fastening; R. Butterworth, Chelsea, S.W. Exhibited by Davies and Hunt,

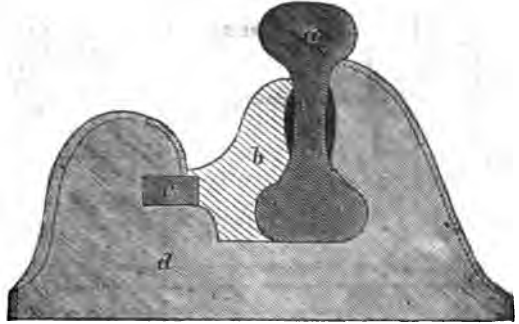


In the end of each rail a semi-circular notch is cut in the web of the rail, so that when the ends of the rails are placed together the two notches form a circular hole. In this hole a circular key, *b*, of wrought or cast iron is placed, the said key being the same thickness as the web of the rail. When the joint is supported in a chair the ordinary wooden key keeps the circular key in its place.

47. Patent Railway Fish Joint Chair; J. Nickless, Coalbrook-dale, Shropshire.

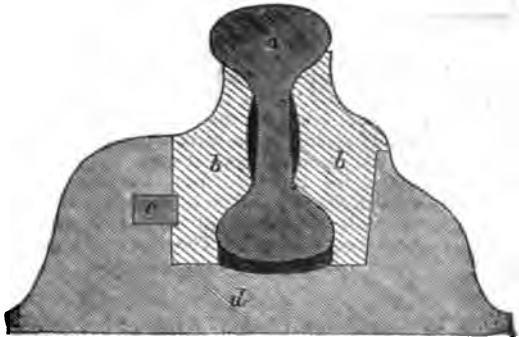
The peculiarity in this joint chair is, that it affords vertical and lateral support to the rails; this is effected in the following manner:—A fish piece of cast iron is wedged between the rails and the ears, by means of a horizontal wedge; the wedge, being made of wrought iron, is partly

split, so that by opening or clinching it, it will remain immoveable.



48. Patent Railway Chair; J. Nickless.

This chair has two cast iron fish pieces which are lifted out with the rail, being wedged with a horizontal wedge. The rails, instead of resting on the bed of the chair, rest on the top of the fish pieces, thus saving the lower portion of the rail from wearing. This chair is cast without a chill.



49. Patent Key Dog Fish for Railway Joints; Honourable W. E. Cochrane, 5, Osna-burgh-terrace, Regent's-park, N.W.

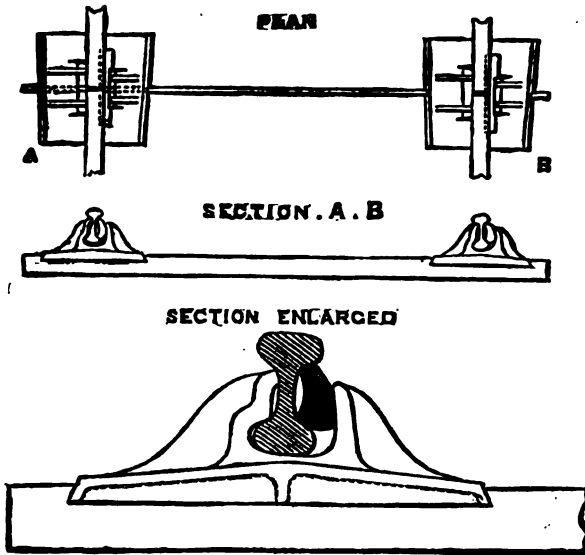
This fish has two or more projections upon it, which fit into corresponding holes in the rails. The fish is secured in the chair by means of a key. This chair has been used on the North Western Railway.

50. Patent Continuous Bed-plate Iron Solid Sleeper Roadway; Thos. Wright & Co., 9, George-yard, Lombard-street, E.O.

The distinguishing feature of this invention is the employment of a single sleeper, as a complete piece of roadway in itself, consisting of one compact and solid mass of iron, capable of sustaining a pair of rails without any longitudinal or transverse joints, being similarly constructed to the bed of a lathe, planing-machine, or steam-engine solid iron bedplate. A slip of wood is interposed between the rail and sleeper, as also between the ends of the sleepers, to lessen the rigidity of the structure. (See Drawing, No. 328.)

51. Patent Bed-plate Transverse Iron Solid

Sleeper, with the Vice-jaw Rail Fastening; Thos. Wright and Co.



In this arrangement each sleeper is independent and complete in itself, and when multiplied continuously, forms the iron way of the railroad, and being on the transverse system, is as readily applied to the rails of existing railways as the common cross sleeper, simply substituting the improved iron for the decayed wooden sleeper; and (as by the action of a vice) the rails are connected to and disconnected from them, at pleasure. The wooden or iron keys, chairs, spikes, &c., are superseded.

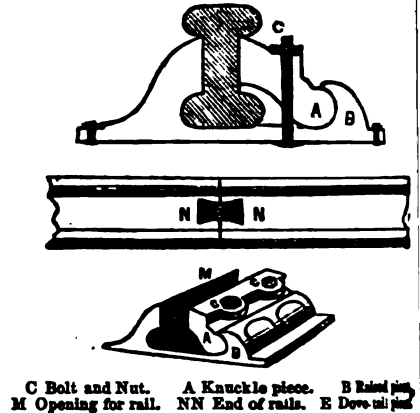
52. Wedge-Joint Chair; Benjamin Burleigh, 26, Great George-street, S.W.

This is a long and heavy chair, with a long cast-iron wedge or an elastic wrought-iron key, fitted on one side in the channel of the rails, and on the other bearing against the jaw of the chair, low down, so as to put very little breaking strain upon it. The angle is very acute, and the keys are placed in the chairs in such a direction that the action of the trains tends to tighten them. This chair has been in use on the Great Northern Railway for two years.

53. Permanent Way; Benjamin Burleigh.

The cast wedge chair above described is formed into a cast sleeper by extending the base, which presents a wedge form on the plan. Opposite chair sleepers are connected by a wrought-iron tie bar, which wedges upon the sleepers, and serves as a tie to strengthen each sleeper while keeping it in position. Thus the whole system of fastening is so arranged by wedges, that the motion of the trains tends to tighten them. The rails are of the usual double-headed section. As a variation these chair sleepers are sometimes used with an elastic wrought-iron key, made to expand in the driving against a wedge-shaped lip on the jaw of the chair. This Permanent Way has been in use for two years.

54. Improved Fish Joint; W. H. Myers, 22, Whitechapel-road, E.



This chair is made suitable to fit the rail in the ordinary manner on the inside; on the outside is cast a raised piece, which is grooved or belled out circular across the entire length of the chair, to receive a circular knuckle piece, which acts or works in the groove or hollow formed in the chair; into the chair are inserted one or more bolts with their heads recessed into the bottom of the chair, passing through the bottom of the chair and circular knuckle piece, are fastened with nuts on the top, as shown in the woodcut. The joint of the rail is fished by means of a female dovetail, slightly bevilled, cut in the end of each rail, into which is placed a male dove-tail piece, also slightly bevilled to fit the female dove-tail in the end which, by aid of the chair before described are held firmly together at their junction.

55. Fish Plate for Permanent Way of Railways; James Murphy, C.E., Newport, Monmouthshire. Exhibited by John Gedge, 4, Wellington-street South, W.C.

This differs from ordinary fish plates by having a supporting plate under the joint of the rail, with side plates made to the form of rail and securely bolted through the rail.

56. Patent Railway Treenail Extractor, and Improved Patent Treenails; R. J. Badger, Manchester. Exhibited by Rancomes & Sims, Ipswich.

To withdraw an ordinary treenail, a counter-threaded screw, having an eye at its upper end, is inserted into the head of the treenail. The eye is attached by a short pin to the lower end of the extractor, when by turning the lever at its upper end the treenail is safely withdrawn. In the case of withdrawing Badger's Improved Treenail it will be only necessary to attach the eye of the iron parallel key to the Extractor, and this key being withdrawn, the wooden portions of the treenail may be removed easily by hand. The improvement in the treenails consists in having a slot cut in the direction of their length, into which an iron key of parallel thickness is firmly driven, after the wooden treenail shall have been driven into its place.

57. Patent Ascending Apparatus; De Cristoforis, 63, Regent-street, W.

On the side of both the propelling wheels of an ordinary locomotive, near the circumference, a given number of small wheels are fixed. These wheels form a series of continual supports against a series of projections connected with the rails. This arrangement enables the locomotive to ascend very steep inclines with perfect steadiness and without fear of ripping, as in the case of ordinary cog-wheels and racks.

58. Whitworth's Self-acting Signal Apparatus and Announcing Bell. Exhibited by B. Vickers, Atlas Works, Sheffield.

In this apparatus the wheels of the engine act upon a lever arm, and depress it. This releases a catch in connection with a sliding bar attached to a balance weight. The weight then falling causes the "danger" signal to be shown, and, at the same time, a bell to be rung. If the danger signal is required for shunting a train, the pointsman has only to turn the windlass somewhat further than is requisite for setting the apparatus for the ordinary signal, and this causes an erection on the sliding bar to press on a double lever, which, lifting up a vertical catch, releases the slide, and thus permits the weight to act on the signal.

59. Patent Switch Point and Signal Controller, for Railway Junctions; John Harrison, 3, High-street, Homerton, N.E.

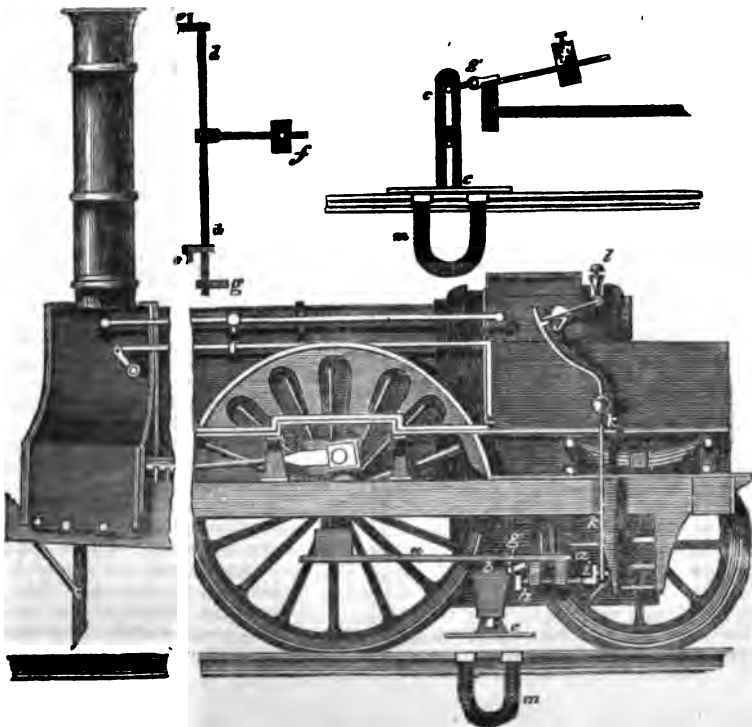
This invention consists in connecting the signals with the switch levers, so that the act of setting the switch throws the signals into such a position as to prevent any train advancing but that for which the switch is set. The signals, when left to themselves, are kept elevated at danger,

by means of weights on the horizontal arms of bell-crank levers, and, when the switch lever is placed in one or other direction for setting the points, the rod is drawn through the eye of the one bell crank lever, while a stop is brought into contact with the other, raising the weight and allowing the signal to descend. This rod, being attached to the switch lever by a clutch, can be instantaneously disconnected.

60. Gibson's Patent Self-acting Railway Signal and Telegraph; Young and Pool, Hull.

In this system of signalling, the wheel of the engine, in passing over and depressing a gently inclined lever fixed to the rail, causes the signal post connected with it to turn to a position at right angles to the line, and thus to indicate "danger" to the driver of the following train. The post remains in this position until the first train has safely progressed a certain distance (say 1,000 or 1,500 yards), when, by the depression of a similar lever, opposite another post, the first signal is altered to "all right," and the second at the same moment indicates "danger," to be in turn released by the third, and so on. The depression of the lever previously mentioned will, when so arranged, cause an electric bell to ring at any station or stations either in advance or in the rear of the moving train, which will thus announce its own approach to, or departure from, any station, tunnel, curve, or other dangerous part of the line. The bell continues ringing until the lever next reached releases it. Another arrangement includes a self-acting compensation for the expansion and contraction of stretched wire. This is effected by an arrangement of balance weights, which keep the wire at one uniform tension in any temperature, without attention. It is applicable as well to the hand signals now in use as to the self-acting signal first described.

61. Patent Railway Signals; W. Bond Paul, Langport, Somerset.

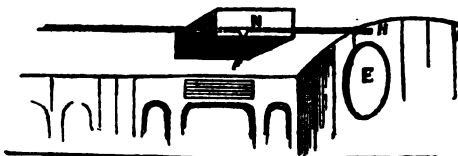


This invention consists in placing along a line of railway, and at such distances from each other as may be found desirable, electro-magnets fixed near to the rails, which, when in action, on the passing of a train, attract a lever attached to the engine, and so placed as to be brought near to the poles of the magnets. This lever, being drawn towards the magnets, on coming within their influence, opens a communication between the steam reservoir of the engine and a whistle. At the stations which the trains run from, a galvanic battery is placed, and from this battery proceed two wires to the next station—one from the positive, and the other from the negative pole. One of these wires passes around or communicates with all the electro-magnets in succession, and, consequently, if the circuit be completed—which may be readily done at any part of the line by placing an electric conductor in contact with two wires—those electro-magnets which are between the points of contact and the battery are at once rendered operative.

62. Signals for Trains in Motion; W. H. Myers, 202, Whitechapel-road, E.

These signals can be applied separately or in conjunction with each other, and may be thus described. The passengers' lamp and sema-

Fig. 1.



H Enclosed Bolt. F Bolt Handle. N Metal Case. C Glass at bottom of Case. E Circular Window.

phore signal, as shown in Fig. 2, is put in action by an enclosed bolt fixed to the roof the whole length of carriage; in every compartment a handle is fixed to the bolt; each of these handles is enclosed in a metal case with glass bottom, as in Fig. 1; to get at the handle the glass must be broken. When the passenger withdraws the bolt, by means of counterbalance weights, the lamp or semaphore rises above the roof of the carriage, as shown in Fig. 2, which could be seen by the guard. One signal is

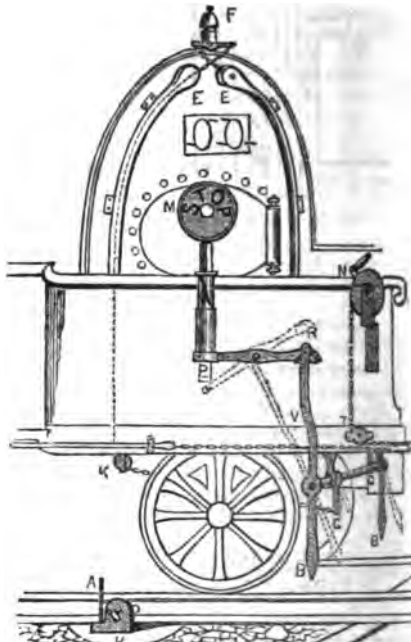
Fig. 2.



A Lamp or Semaphore. B Catch for Bolt. C Counterbalance weights. E Window. F Tube holding weights. N Friction Pulley in Tube. H Bolt Hole.

sufficient for a carriage. At night, the lamp being down opposite the circular window will give light inside the carriage, serving two purposes at one expense. Fig. 3.—Under the foot

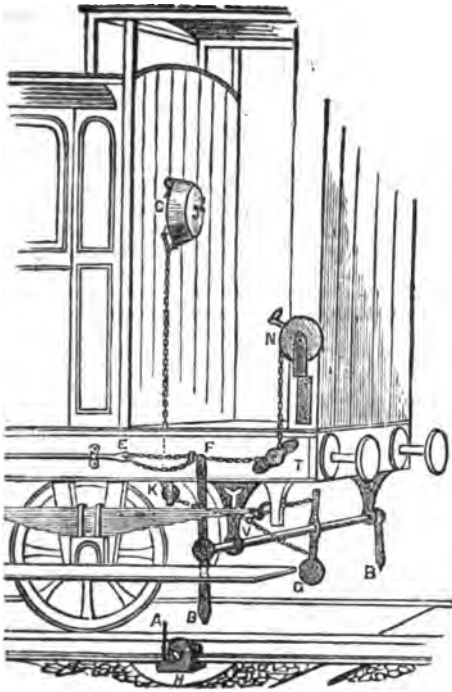
Fig. 3.



F Steam Whistle. EE Tubes with friction pulleys and chain. K Landing Pulley. GG Levers. BB Pendant Lever. V Upright Lever. M Semaphore or Lamp. R Double-armed Lever. N Wheel. T Chain and Pulley. A Screw Clip and Tappet. H Opening for drainage.

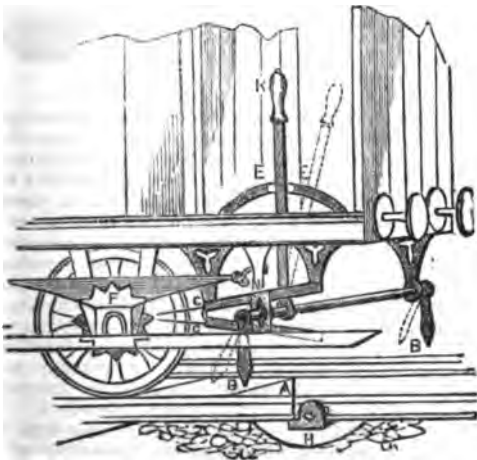
plate of the engine a small shaft is fitted, to which the pendant and other levers are fixed for the purpose of turning on the engine whistle by either guards, station-masters, or any other of the railway officials, acting as a flag danger signal; it is acted upon, whichever way the engine may be running, by a spring or tappet in a clip screwed to the rail, hereafter described. At the side of the framework of the engine is placed a lamp for night and a semaphore for day, which is attached to a screw supported by a double-armed lever, held in a horizontal position by an upright lever; the pendant lever being struck by the spring or tappet of the clip causes the lamp or semaphore to turn round to present the word "stop" immediately in sight of the engine-driver. By means of the wheel the engine-driver can give notice of danger to the guard by putting in motion an alarm-bell, as shown in Fig. 4, which is placed in the guard's compartment of the carriage, and acted upon by means of pendent levers fixed on a shaft near the carriage; the pendant levers being acted upon by the before-mentioned clip: it is by the engine-driver's wheel, or station-master's sliding-spring, Fig. 7. The usual lamps placed at the back of the guard's compartment of the carriage, as the last carriage of the train, are made to rise above the roof as a means of signalling between guard and engine-driver, showing to him a green and red light; it has the same red lights behind at one expense for lighting. Fig. 5.—On an axle of the carriage wheel is fixed a ratchet or toothed wheel, revolving as the

Fig. 4.



C Alarm Bell. K Leading Pulley. V Chain Junction.
Counterbalance Lever. BB Pendant Levers. F Upright Lever.
N Wheel. T Leading Pulley. E Connecting Rod.

Fig. 5.



F Ratchet or Toothed Wheel. CC Springs. K Handle with Lever.
BB Pendant Levers. EE Quadrant with Catch.
N Small Double-armed lever.

riage proceeds, which is acted upon by means of two springs, over which the guard has perfect control by means of the lever with handle in his compartment of carriage; this ratchet can also be used by the engine-driver by his wheel, and by any other railway official by the screw-clip, on both sides of the carriage. It is calculated that this toothed-wheel would make a rattling noise of greater power than the steam-whistle; it would be quite sufficient to attract the engine-driver's attention, and could be mistaken for no other sound. The communica-

tion between guard and engine-driver is effected by rods and chains working through friction pulleys or screw eyes fixed to the carriages.

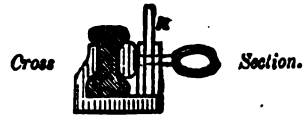
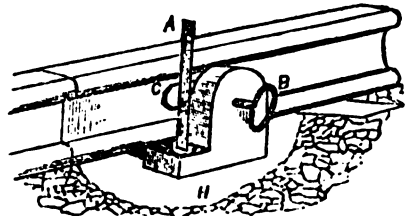


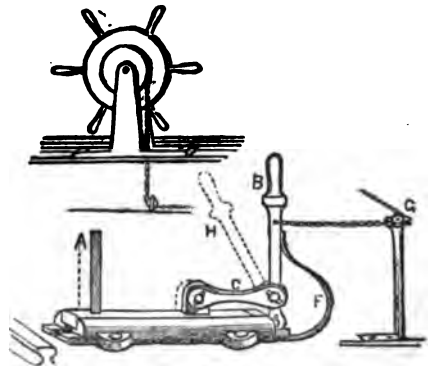
Fig. 6. Perspective View.



A Spring or Tappet. B Screw. C Wedge.
H Opening for Drainage.

Fig. 6.—The fog or accident screw-clip with spring or tappet is intended to grip the lower flange of the rails by means of a screw, at any of the openings already made for the purpose of drainage between the sleepers. Upon the pendent levers on the engine and carriage striking against the spring or tappet, they will put the steam-whistle, the lamp or semaphore on the engine, the alarm-bell or rattle fitted to guard's carriage, into immediate action, making these signals a complete communication of danger between engine-drivers, guards, station-masters, or other railway officials. Fig. 7.—The station-

Fig. 7.



A Spring or Tappet. B Handle of sliding spring.
C Connecting Rod. F Spring at back. G Leading Pulley.

master can give notice of danger to the engine-driver and guard to stop a train in motion, by applying a sliding spring or tappet at a long distance from the station, without the necessity of leaving his duties at the station, causing the steam whistle, the revolving lamp, or semaphore on the engine, and the alarm bell or rattle on the guard's carriage to be put in motion.

63. Patent Railway Brake; J. Sutherland, 37, Pickerington-street, Paddington, W. Exhibited by J. S. Morris, 3, Earl-street, City, E.C.

The object of the inventor is to lock all the wheels of the carriage or waggon simultaneously at pleasure. This is effected by

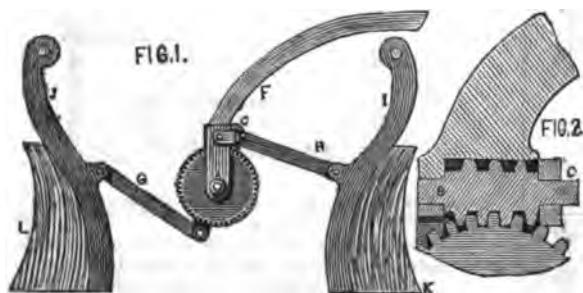
placing drums on all the axle shafts of the carriage; round these drums are placed iron friction-bands coupled to a horizontal lever running along the frame of the carriage. This lever brings the bands into contact with the drums, thus acting as a brake. (See Drawing, No. 327.)—(See *Civil Engineer and Architects' Journal* for July, 1857.)

64. Patent Self-acting Railway Carriage Brake ; Wm. Paxton, 23, Skinner-street, Snow-hill, E.C.

This brake is put in motion by the ordinary pressure on the buffer-rods, in stopping a train, and it allows a carriage, immediately on being stopped, to be pushed backwards without the necessity of awaiting the recoil of the buffer-springs. This is effected by means of a drum or wheel running loose upon the axle of the carriage-wheels, and carrying a spring catch, by which it engages, and is borne round with the carriage-wheels whilst proceeding in a forward direction, but from which they are released when turning in a backward direction.

65. Improved Railway Brake : Edward Finch, Bridge Works, Chepstow.

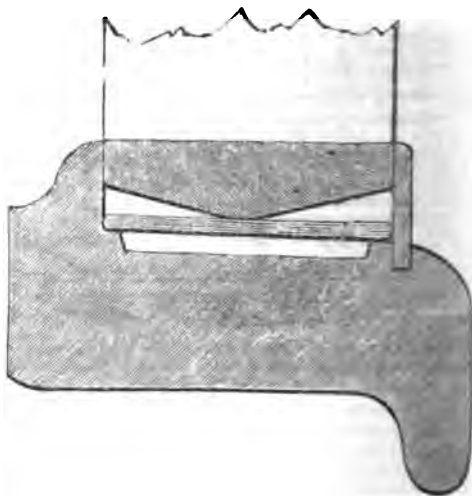
This invention consists in a means of altering the position of the lever in respect to the axis by which the breaks are actuated, so as to compensate for the wear of the blocks, and by this means always to maintain the lever in the same position in relation to the carriage or waggon. For this purpose the end of the break lever is arranged so as to move on the axis by which the breaks are actuated, and the break lever has attached to it a worm which takes into a worm wheel on the axis, so that as the blocks are worn away, by turning the worm attached to the break lever its position can be adjusted so as always to retain the same position in relation to the carriage or waggon.



66. Improved Railway Wheel, entitled a Horse Foot Wheel ; W. Bridges Adams.

This improvement has for its object; first, by placing an elastic substance between the tyre and the wheel, to reduce the non-elastic load to the tyre itself, which may be made much lighter, by reason of being saved from blows and by the absence of holes through it; secondly, by this arrangement a lighter wheel may be used, or one of cast iron, inasmuch as, the blow being prevented, there will be no tendency to break ;

thirdly, the wheel may be put together with the tyre cold by simple screw pressure, without needing skilled mechanics; fourthly, the tyre and wheels being all formed to exact gauge, a worn tyre can be taken off and replaced in any locality without needing workshops or machinery. The tyre is formed with an internal rib at the front, and the periphery of the wheel is turned so as to bear only at its mid-breadth. The internal portion of the tyre under and round the wheel is hollow, and a hoop of spring steel, three inches wide and 3-16 of an inch thick, is supported in two fillets on which the wheel rests. The spring for convenient manufacture is made in two halves, and they form a slight incline, so that the wheel enters easily at the back.



and, being forced up the incline by screw pressure, acquires sufficient tightness to become firm. A small groove, about 3-16 of an inch in depth, is turned in the back of the tyre parallel with the plane of the wheel, and in this is placed a false rib of iron or steel with a small piece cut out of it to allow the rib to be compressed and spring into the groove when the opening is keyed up and the wheel is secured in its place. The wheel is quiet and easy, without any ringing noise. If desired, the tyre may be put on with slight pressure, and the interstice filled with tallow, so that on curves the tyre may wear round slightly to compensate for the inequality of the path-way, acting as a loose wheel. The cost of this wheel will not be greater than that of ordinary wheels, as the lightening of the tyre will compensate for the steel. The number of joints is diminished, the ordinary wheel having eighteen joints, and this wheel only six joints. Experimental wheels of this construction have been in use now eight months on the Eastern Counties Railway, first in a coke waggon, and then in a first-class carriage, and they are now being applied on the North London Railway. On the Eastern Counties they are also about to be applied to the coupled driving wheels of a locomotive engine when they will serve the object of preventing the destruction of tyres and rails and also of equalising the alternate thrust and pull of the connecting rods.

67. Railway Wheel ; W. Bridges Adams.

This model shows wood applied in a continuous hoop between the wheel and tyre.

68. Improved Railway Wheel ; James Murphy.**69. Patent Locomotive Engine ; George Inman, Susannah-street, Poplar, E.**

The object of this invention is to economise motive power when applied to locomotion. This it is proposed to effect by causing high-pressure steam or other motive power to expand a series of hollow discs or steam chambers arranged round the axle, and carried by each of the wheels of the locomotive. These discs or chambers are connected by radial pipes to the boss of their respective wheels, and have attached to their outer or moveable ends radial rods, which pass through slots in the periphery of the wheels, and carry feet, which bear upon the ground in succession, for the purpose of driving the engine forward. The steam is generated in a boiler mounted on the frame of the engine, and it is conducted through the hollow axle of the driving wheels to the boss of the wheels, whence it passes through the radial steam pipes to the several hollow discs or steam chambers. Between the boss of each driving wheel and the axle is an annular valve, which admits and discharges the steam at the proper time to and from the several steam chambers in succession, and by an arrangement of shifting gear, the position of this valve may be changed at pleasure, so as to reverse the motion. The steam chambers of the discs may be usually made of india-rubber, joined together at their outer edges by a ring of metal, which will prevent them from expanding in the direction of their diameter; but when great power is required to be exerted, the expanding and contracting chambers may be made of metal.

70. Apparatus for expediting Town Postal Communication ; O. H. Hodges, 5, Crown-street, Finsbury-square, E.C.

It is proposed that this apparatus should consist of a subterranean tube, with small boxes or carriages travelling within it, for receiving letters dropped into pillar letter-boxes. The letters are thus to be constantly transmitted to the central stations for delivery. (*See Builder*, July 4, 1867.)

71. Patent Omnibus and Carriage Break ; Robert Ker Aitchison, New North-street, W.C. Exhibited by Davies and Hunt.

This break is self-acting. When the horses stop the backward thrust of the pole acts upon

two levers, which apply the breaks. The same effect is produced by the carriage overrunning the horses in descending a hill. When the horses begin to draw, a spring releases the breaks. There is a treadle by which the driver can lock the pole, and thus prevent the break from acting when backing, or when otherwise desirable.

72. Cab Omnibus ; V. De Tivoli, 18, Stanley-place, Pimlico, S.W.

This omnibus is placed on DeCristofori's conical wheels, and has an arrangement by which a brake is applied on the backing of the horses.

73. Patent Indicator for Omnibuses, &c., Francis Parker, Elm-house, Homerton, N.E.

This apparatus consists of a tube with a box at the top filled with balls. There is an arrangement by which one ball at a time is allowed to fall into a lower compartment, and strike a bell, thus indicating the number of passengers. (*See Drawing*, No. 363.)

74. Carriage-door Shields ; Charles Norton, 34, Hawley-road, Camden Town, N.W.

These are designed to prevent accidents arising from the shutting of railway or other carriage doors. They consist of metal plates, folding over each other, on the hinge side, so as to prevent the possibility of the fingers being crushed.

75. Patent Tubular Carriage Shafts ; John Clarke, High-street, Shiffnal.

These shafts are made of a taper tube of malleable iron, and are said to be stronger, cheaper, and more durable than ordinary wooden shafts.

76. Patent Horizontal Fin-expanding Canopy, for Carriages, Boats, &c. ; T. L. Scowen, Allen-road, Stoke Newington, N.

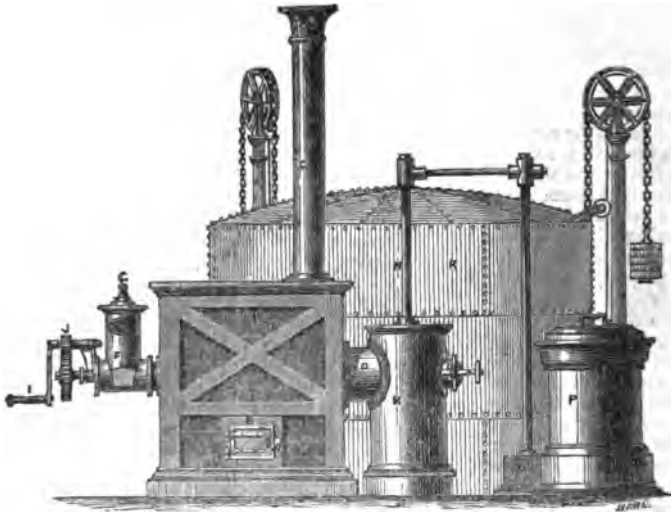
This canopy is constructed on the principle of the fin of a fish, with a horizontal action, which enables it to be made to any shape or size, and to fold up in an instant. A canopy for an open carriage when folded, lies in the compass of an umbrella. It can be made of any material, according to the purpose for which it is designed. The omnibus canopy, which forms a back to the seat when folded, is worked up or down by means of a right and left hand screw, working two nuts, which are attached to the lower ends of standards, enabling the conductor to raise and expand the canopy over the roof in a few seconds. This method of raising or lowering the canopy is equally applicable to boats and many other purposes. (*See Drawing*, No. 364.)

MACHINERY AND MANUFACTURING APPLIANCES.

(For the remainder of the Articles in this Section, see Drawings.)

80. National Coal Gas Apparatus; J. T. B. Porter, Lincoln.

This apparatus is suitable for the manufacture of gas either on a large or small scale; but it is peculiarly adapted for supplying private houses, workshops, railway stations, lighthouses, and ships, and consists of



a retort placed inside a case lined with fire brick, such retort being furnished with an Archimedean screw for the facility of supplying it with fresh material, the screw at the same time discharging the coke or other carbonised substances which have been exhausted of their gas. Each charge of the retort is led at one end through a vertical pipe, having a flange

fixed on its upper end, into which a plug is fitted; this pipe opens into a chamber, in which the screw works, and as fast as the material is exhausted of its gas it is pushed out by the screw at the opposite end and replaced by fresh material, which is traversed through the retort by occasionally turning the screw; this may be done by winch handle, fly wheel, or gear work fitted for that purpose. The coke or other substances from which the gas has been exhausted fall through a descending discharge pipe into an iron vessel, or a reservoir of water, if required, and may be removed in any convenient manner. The gas passes up through a pipe to the condensing and purifying apparatus. (See Drawing, No. 346.)

81. Patent Gas Apparatus; Sharman and Smith, Wellingborough, Northamptonshire.

This invention consists in using an upright conical retort, with suitable flues, by which means a greater quantity of gas, in proportion to the amount of coal consumed, is produced; and by the manner in which the retort is surrounded with flues, a larger amount of its surface is presented to the action of the fire. In the arrangement for purifying the gas, the supply of water through which the gas passes is regulated by means of stop-cocks; the purifier and the gas are made to take a long and tortuous course through the water, and over and under a sufficient number of beds of lime before passing to the gasometer. The model shows a complete apparatus for making gas to supply three or four lights, with the exception of the tank and holder.

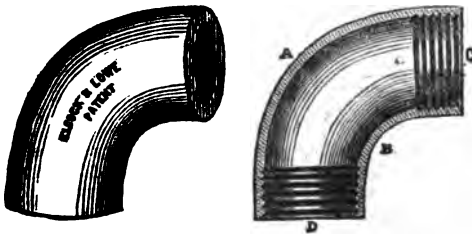


82. Patent Dry Gas Meters; James Meacock, 7, Snow-hill, and Giltspur-street, E.C.

In this meter the leather diaphragm is held between two flat metal rings and screwed up to a frame, instead of being fastened with the soldering iron, which is apt to injure the leather. The valve adopted in this meter does not rise from its facing.

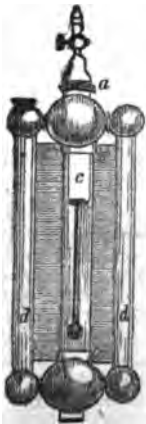
83. Patent Wrought-Iron - Round Elbow; Elcock and Lowe, Holyhead-road Tube Works, Wednesbury, Staffordshire.

These wrought-iron round elbows may be made from 1-16 to 2½ inches internal diameter, and, being rounded on both the inner and outer sides, ensure a steady transmission of the gas, steam, water, &c., passing through them, and, as the peg or tool upon which the welding is performed is so formed as to circle round the angle B, the inner section is finished and made smooth, and a perfect soundness of weld is ensured.



84. Patent Gas and Air Test Gauge; W. Reichenbach, 33 and 34, Borough-road, Southwark, S.E.

This is an instrument for detecting any impurity that may arise in the process of manufacture of gas; also for testing the quality of deleterious air in mines or confined spaces. In the accompanying woodcut, *a* is a cross cap, to be unscrewed for the insertion of test papers into the glass tube *c*, for the detection of any



deleterious product; the tube *c* has also a thermometer (marked *b*) to show the temperature of gas in the process of manufacture; *d d* are side tubes, to give the pressure for distribution.

85. Annular Recoil Engine; T. Ivory, Ainslie-place, Edinburgh.

This engine has two arms, which are open at their outer extremity except in so far as they are closed by an outer ring, and they are arranged so as to be capable of being made to revolve freely within the ring round the centre, at which steam or water is supplied for moving them. There is an orifice at the extremity, for the escape of the steam or water. The area of this orifice may be one-fourth of that of the arm or tube on the cross section. There is a fixed ring supported on a frame work, and the extremities of the arms are all but in contact with the interior of the ring, so that the only outlet of the steam or water from the arms into the atmosphere is through the side orifice at the end of each. On steam or water being admitted into the arms at the centre, and allowed to escape at the orifices, the pressure will cause the arms to revolve by means of the pressure on the area of the orifices, and in the direction opposite to that portion of the outer ring against which the steam for the time impinges. By this means a continuous rotary motion of the arms is kept up while steam or water is supplied. A distinguishing feature of this mode of producing rotary motion is, that whatever be the length of the arms, the effective pressure is always applied on the same area, and thus, by the steelyard principle, the greater the diameter of the circle described by the arms, the less is the expenditure of steam for the same work done.

86. Double Acting Horse Wheel; Thomas Mann, Boro'bridge.

This invention consists of an upright shaft, fitted with a platform at its lower end, upon which the horse or horses walk. This platform is supported by suitable suspension rods connected with a boss on the shaft. The horse or horses are yoked to a bar, which is fixed to a collar or socket revolving loosely round the upper portion of the shaft, so that, as the horses attempt to walk; the motion of their feet will cause the platform to rotate in one direction, whilst their shoulders will push the bar or power lever round in a contrary direction. In order to combine these two opposite movements, a spur wheel is keyed on to the upper end of the shaft, and a set of internal toothed segments are fixed to a set of arms radiating from the loose collar or boss, and revolving with the power lever. Between this internal and external gear is a pinion which gears into both wheels simultaneously, and as they both revolve in opposite directions, they will impart one uniform motion to the pinion, which, through its shaft, transmits the movement to any required machinery.

87. Dynamometer; John Alcock, 3, High-street, Bolton.

This instrument is intended to measure and indicate the power required to drive any particular machine. It consists of a spring balance attached to a band fastened to the periphery of a wheel, attached to one side of which is a frame carrying toothed wheels at one extremity and a balance weight at the other; this is so arranged as to act upon the spring balance, and indicate the strain put upon it.

88. Eighteen-inch Planing Machine ; Batho and Bauer, Salford, Manchester.

The novelty of this machine consists in the manner in which the object operated upon may be adjusted, and the arrangement of the link motion, to effect a quick return, as well as uniform motion, whilst cutting. To the underside of the table is attached a screw, the nut on which is connected with the link, so that in planing an object of a hollow square form, it is not necessary to travel over the centre opening.

89. Patent Double-Action Traversing Drilling Machine ; Andrew Shanks, 12 John-street, Adelphi, W.C.

This machine is especially adapted for making cotter-holes, mortices, or key-ways in metal ; also for grooving shafts, axles, &c. The article operated upon is placed in the centre of the machine by means of the concentric vice and poppet headstud, the two drills being driven by top driving, like an ordinary lathe, the diameter of the drill determining the width, and the variable crank at the end of the machine operating on the carriage determining the length of the mortice or groove required.

90. Patent Horse-shoe Machine ; Henry Burden, Troy, New York. Exhibited by Davies and Hunt.

In this machine, the red hot bar is placed in the trough, and is drawn in by the feeding rollers, cut to the proper length, and bent to the required form. The toe is then pressed between two cams, to make it thinner and broader, and bevil the inside ; a flange preventing the shoe from spreading. Another cam then punches the grooves and nail-holes, after which the shoe is straightened, and falls out of the machine complete. The machine is capable of making sixty shoes per minute. There is an arrangement for stopping the machine when there is not a sufficient length of bar to form the complete shoe.

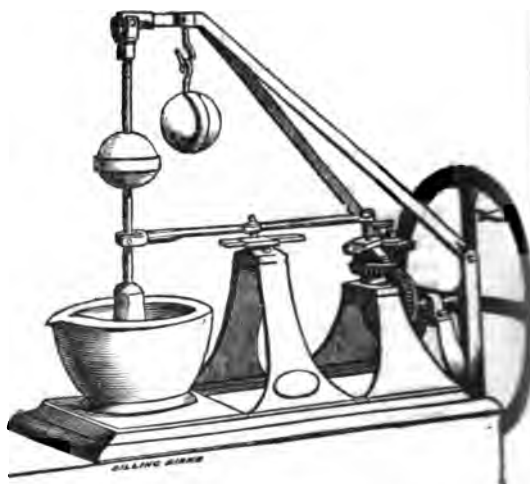
91. Double Platform Weighing Machine ; Julius Schonemann. Exhibited by R. and L. R. Budmer, 2 Thavies-inn, Holborn, E.C.

This is suited for small parcels, but the principle is applicable to weighing machines in general.

92. Patent Grinding and Levigating Apparatus ; H. Goodall, Derby.

This invention consists in an arrangement whereby the operations of grinding or levigating various substances may be performed by the aid of a pestle instead of rollers or flat grinding surfaces. The materials to be operated upon are placed in the mortar, in which the pestle is made to work by mechanical means, in such a manner as to give the same rubbing motion and. The pestle may be w red extent, and as it

traverses over a different surface every time, there is no necessity for scrapers.



93. Specimens of Irregular-shaped Timbers. Exhibited by Kinder, McNaught, and Smith, Worcester.

These timbers are produced by the wood shaping machine recently patented by Mr. Arthur Kinder. This machine can be made to perform the following operations ; sawing, boring, morticing, surfacing, either on the flat or curved work, producing regular, irregular, or winding bevils, tenons, grooves, rebates, &c. It will also saw ships' timbers to the proper shape at one operation. The specimens exhibited are as follows :—No. 1 illustrates planing ; No. 2 regular bevil ; No. 3 winding bevil straight ; No. 4 six specimens of tenon cutting ; No. 5 curved work on the square ; No. 6 curved work on the winding bevil ; No. 7 curved work on the regular bevil ; No. 8 curved work on the horizontal ; No. 9 rebating, square and bevilled ; No. 10 grooving with quirk on edge ; No. 11 curved grooving ; No. 12 boxing irregular surfaces ; No. 13 beading ; No. 14 double compassed work. Eleven pieces marked A are full-sized carriage timbers, joined wholly by machinery. (See *Practical Mechanic's Journal* for January, 1858.)

94. Improved Method of Cutting and Shaping Spokes ; Benjamin Beale, 7, Lambton-terrace, East Greenwich, S.E.

The improvements consists in cutting or shaping the spokes while revolving round or oscillating on a centre eccentric to the centre of the spoke. The tenons are cut, and the shaping of the spoke completed at the nave end on the same principle. This operation may be performed by placing a number of spokes at a proper angle on a sliding table, and passing them against suitable cutters. Spokes of various kinds are exhibited.

95. Patent Oil Can ; John Jobson, Bulwark-street, Dover.

This invention has for its object the better regulation and insuring the supply of oil to

of machinery, &c. For the tube is placed over the spout of the tube is a piston, which may be moved up and down. The spout from the tube is carried up at the side of the tube, and an opening at the side at the end of the tube, for communication with the tube, for the oil.

Inventor: John Bailey, Albion

The invention consists of an oil chamber with a bearing, the oil being allowed to flow from a needle point and a small valve at the bearing, the amount of flow being regulated by a screw.

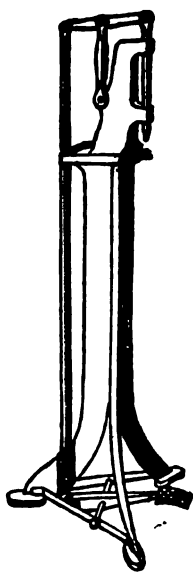
Inventor: Vice; W. Adkins, Shadwell, Birmingham.

This vice have a parallel motion, by a sliding bar, acted upon by

Inventor: Bolt and Nut; James Murphy, by John Gedge,

The object has for its object the fixing of bolts or bolts in plates, in so secure a manner as to assure the nut or bolt from all vibration after it shall be keyed. Each bolt is secured or indented across the threads and the nut or plate grooved or indented in like manner, and these grooves are to receive a screw or plain pin.

Inventor: Not Lever Press; R. Houchin, North-pl. New North-rd. Hoxton, N.



This machine is used for fixing and closing eye-

lets. It enables the workman to have both hands at liberty to hold and adjust the work, while pressure is obtained by the foot.

100. Improved Silk Throwing Machine; B. A. Murray, 2, Trinity-place, Trafalgar-square, W.C.

This machine produces weft in one operation, and warp or organzine in two operations from the cocoon or skein. If from the cocoon, the silk may be reeled or partly spun as experience may direct; in either case the three operations of spinning, doubling, and throwing are effected at once, and may be done with the ordinary speed of the throwing mill; the weft more speedily than in the usual way, as the machine has the novel feature that the reel taking up imparts a twist as well as the reels or bobbins giving off.

101. Patent Balanced Presser; W. Sumner, Bold-street, Preston.

The object of this presser is to equalise the strain on the thread during the time that it is being wound on the bobbin.—(See *Practical Mechanics' Journal* for July, 1867.)

102. Patent Metal and India-rubber Picker; H. Heald, Sadden Whalley, near Blackburn.

Pickers are used in weaving for the purpose of throwing the shuttle to and fro across the warp. Hitherto pickers have been made of leather, buffalo hide, or wood, but this invention consists in making the whole frame of the picker of metal, with a cushion or packing of india-rubber where it strikes the shuttle. The india-rubber is kept in its place by means of a collar or narrowing in the packing chamber, and the packing is effected by stretching the india-rubber and passing it through the collar, and then allowing it to collapse. It is stated that pickers of this description will last twice the ordinary time, and when the india-rubber is worn out it may be renewed at a small cost. By the use of this picker, the damage to the cloth, so frequently caused by pieces of the old picker flying into it, is prevented. (See *Mechanics' Magazine* for August, 1867, No. 1775, Vol. 67.) The specimens exhibited are—1. Plain calico loom picker; 2. Drop-box loom picker for weaving stripes and checks; 3. Plain calico loom picker, not packed; 4. Plain broadcloth loom picker; 5. Drop-box do. do.

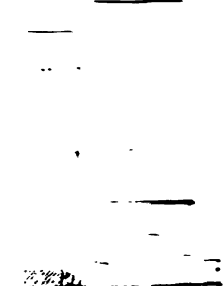
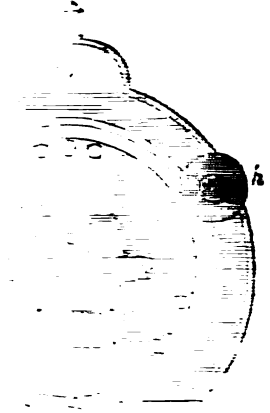
103. Patent Electro-plated Printing Rollers; J. D. Mucklow, Blackford Bridge, near Bury, Lancashire.

Four models are exhibited:—1, Represents a plain iron roller or cylinder (on mandril), ready for engraving; 2, An engraved iron roller, previous to its being electro-plated; 3, A roller electro-plated with copper; 4, Electro-plated with nickel.

104. Patent Rope Machine; Archibald Smith, Princes-street, Leicester-square, W.C.

The peculiarity of this machine consists in the arrangement of the reels containing the wires

Fig. 2



92.

l
h
m
be



or strands, which are required to be laid together so as to form strands or ropes in the centre of a revolving frame of small diameter, in such a manner that all motion to the reels and their contents and frames, as well as all twist or torsion to the individual wires or strands is avoided. The engraving marked Fig. 1 shows a perspective view of the complete machine. Fig. 2 a cross-section. Fig. 3 longitudinal section of one compartment. A, reel containing wire or strand; B, frame for carrying the reel, mounted in bearings, in centre of disc C, and having a weight, I, attached to underside, to prevent it being carried round; C, disc with three tubular distance pieces between each pair, and bolted together by long bolts; G, roller supporting disc C; H, H, ditto, or frames D, steadying same. The machine is composed of a series of discs framed together, having between each a reel frame, as shown, and at its one end a laying plate attached thereto. This frame is driven by means of a strap, and is geared to the necessary draw-off apparatus. The wires or strands pass from reels A, through noes of frames C, and emerge by angular holes on the front sides of disc C, over small pulleys on the tubular distance pieces F, along through holes in each disc, till they reach the foremost one, thence through a laying plate to a nipper or tube. Motion being given to the frame (the bobbins, by means of the weight I, being prevented from turning), the wires or strands are laid together, and drawn off simultaneously. These machines are said to have the following advantages, viz.: a much greater speed without danger to the workmen, economy of power, less wear and tear, while the workman is enabled to see the state of the reels during the working of the machine, and thus avoid many defects in the manufacture. (See Drawings, Nos. 340 and 341.)

105. Patent Improvement in Connecting the ends of Submarine Telegraph Cables; W. B. De Blaquiére, 50, Pall-mall, S.W.

This invention consists in opening the ends of the outside wires of the cable, passing them through a circular metal wedge (or longitudinally perforated cone) and turning them back over it, the ends being secured on their own parts by wire seizings. The electric wire is then joined in the usual way, covering it with the ordinary coating of gutta percha, sufficient length being allowed to take a half or round coil with it (this is very essential, as it provides for stretching without endangering the continuity of the electric wire); it is then placed carefully in a tubular cover, divided into two segments lengthwise, the wedge or cone-shaped ends of the outer wire being so placed as to bear against the inside cone formed near the ends of the tubular cover for that purpose. The two segments of the tubular cover, filled with gutta percha or other suitable insulating substance, are then brought together and screwed up tight by means of nuts and key nuts placed

at the ends, so as firmly to grip the cable and protect the part where the joint has been made. Different sized cables can be thus connected.

106. Apparatus for Paying-out Submarine Telegraph Cables; Lionel Gisborne and H. C. Forde, 6, Duke-street, Adelphi, W.C.

In this apparatus the cable is passed over a pulley, which is carried by an arm (E), (as shown in the drawing, No. 483,) suspended from a universal joint immediately over the centre of the coil, and it has also another universal joint near the pulley (D); thus the arm can oscillate in all directions, and the pulley can follow the succeeding coils in which the cable is laid in the vessel. The cable next passes under a stationary pulley (F), and then over a drum (G) (which is governed by a break), worked with levers (L¹ L²), around which it takes several turns; the cable then passes over a pulley (H), and descends under a moveable pulley (I) which is weighted, and has a quantity of chain attached to it, and when the strain comes on the cable it draws it more and more nearly into a straight line, lifting at the same time the weighted pulley, and so becoming subjected to a continually increasing weight. The weighted pulley in its rising and falling is guided by two uprights (O O), at the upper and lower part of which there is a spring or buffing apparatus (P P), to counteract any sudden rising of the pulleys. The cable lastly passes over two guiding pulleys (M N) to the stern of the vessel. On the upper coils of the cable in the hold of the ship are placed numerous spherical weights (C), which cover the whole upper surface of the coils, and they at all times keep a slight strain on the cable, and prevent it, as it runs out, from drawing up portions of the coil with it. The weighted moveable pulley (I), mentioned above, will be so weighted with chains that when it is pulled up to the top, or nearly horizontal with the pulleys (H M), it will register the maximum safe strain on the cable; and to guard against accidents from excessive strain, the apparatus attached to the pulley (I) is furnished with a cup or box (K), which, as it ascends gradually, picks up the chain or hanging weights (L) attached to the end of the compound levers (L¹), and thus, by gradually relieving the breaks, allows the drums (G) to work more freely. The uprights (O O) may be so graduated as to register at all times the strain on the cable.

107. Patent Corrugated Grooved Wheel, for submerging Submarine Telegraph Cables, driving Machinery, &c.; C. and G. Johnson, East-hill, Wandsworth, S.W.

The periphery of this wheel has a deep channel, the sides of which are inclined at a small angle, and are corrugated. The rope to be payed out being passed round this wheel, receives a series of grips from the corrugations.



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C, small valve or sluice; D, small flap-valve connected with the valve C, by the link E, so that when C is raised D is closed; F, rod to machinery G; on turning the winch-handle H, the rod F is raised, opening the valve C and closing D, allowing the water from the chamber B to run off to the lower level through the opening C. The high-level water then presses in an upward direction against the sluice A, (the water in the chamber having been run off as described) and forces it upwards, the rising being regulated by the machinery G. In locks, the water is generally at the same level on either side when the sluice is required to be lowered, in which case it descends by its own weight; but, should it be required to lower the sluice against a pressure—that is, when the water is running from one level to the other—the rod F in descending closes the valve C and opens D, allowing the water in the upper level to fill the chamber B, producing an equilibrium of pressures, and the sluice is then lowered by the machinery.

113. Perforated Paddle Wheel Float; H. D. Deane, 18, Pigott street, East India Docks, E. (See drawing, No. 333.)

114. Patent Enclosed Screw, &c., for Auxiliary Steam Ships; J. M. Hyde and Co., Cumberland Iron Works, Bristol.

This screw is perfectly enclosed within the run of the ship, by sliding plates fitted into grooves, and falling like flood hatches by their own weight; it offers no resistance when the ship is under canvass, and by raising these slides it can be at once brought into use.

115. Patent Iron Masts and Yards; James Hodgson, 16, Sweeting-street, Liverpool.

In this invention the ribs are outside instead of inside, and may be made by rivetting angle iron to the plates, or by bending the edges of the plates outwards, and then rivetting them. These ribs being outside, increase the diameter of the base of the mast or column, and give greater strength. This arrangement enables the rivetting to be done by steam.

116. Finch and Lamport's Patent Iron Mast for Ships; exhibited by Finch and Heath, Bridge Works, Chepstow.

These masts are made with a joint at the deck, by means of which they may be immediately cast overboard in cases of extreme necessity, and this joint is the strongest portion of the mast under ordinary circumstances. The masts may also be made without this joint. They are said to be lighter, stronger, and more durable than ordinary masts. A full-sized section is exhibited. (See drawing, No. 333.)

117. Iron Yards for Ships, with mode of reefing and furling the sails without going aloft; Samuel Dyer, Bristol.

118. Improved mode of Reefing and Reducing Top Sails; W. A. Gilbee, 4, South-street, Finsbury, E.C.

This invention consists, first, in running lines from the reef between the head of the topmall and the fore part of the yard, and direct up to the head of the topmast; secondly, in arranging the reef tackle beneath the yard to run from the end of the yard to the quarter deck; thirdly, in the peculiar mode of strengthening the sails by bands and double ropes.

119. Improved Marline-Spike; J. Simon Holland, Woolwich, S.E.

The section of this marline-spike is oval, that of the old one being round. The improved one is a lever, as well as a wedge, for, on turning it on its axis, every time it comes flatways, between the strands of a rope, it may be pushed further in, and then, on further turning it the strands are separated by leverage.

120. Double-bodied Windlaas; Samuel Dyer.

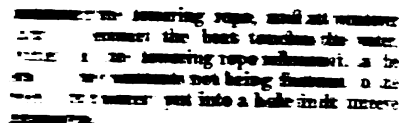
121. Improved Capstan; Samuel Dyer.

122. Improvements in Working Windlasses; G. D. Davis, 40, St. Leonard's-road, East India-road, E.

In this invention the windlass is worked by an endless chain, the links of which fit into a wheel with recesses, which hold the links and prevent the chain from slipping. (See drawing, No. 335.)

123. New Method of Lowering Ships' Boats; C. Oliford.

By this new method, lately patented, a boat laden with the full crew can be lowered in a few seconds, no matter what its weight or size, or whether the ship is at anchor or at full sail or steam. The lowering is done by one only of the crew from the boat, who, by paying off a single rope, at one time unlashes, lowers, and disengages the boat. The accompanying Fig. shows a cross view of a boat and the gear used for lowering. A is a roller which works freely in bearings at each side of the boat under one of the seats. B is the lowering rope, which is slackened off when lowering, one end of it being made fast to the roller and then wound on it a length equal to the distance the boat will have to descend from the davits to the water. C C are two other single ropes or pendants, which are made fast to the davits and pass through the 3-sheave blocks D D and the leading blocks F F; the ends of each then enter the same hole in the roller, but in opposite directions. By hauling on the lowering rope B the roller is turned round, and the pendants are wound on it a length equal to the distance the boat will have to descend to the water, and the end of the lowering rope is then made fast over a cleat on the boat's seat. D D are the 3-sheave blocks through which the pendants C C pass. They are firmly secured to the boat by a strap attached to the block F, and act like a "turn and a half" in the boat on



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and getting them quickly
back single stow or pull from
the hatch out at an oblique angle
the extrusion of which
support the bow is very
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At this chain consist in the hollow centre stand, when as the chain, acts as a hinge of the link.

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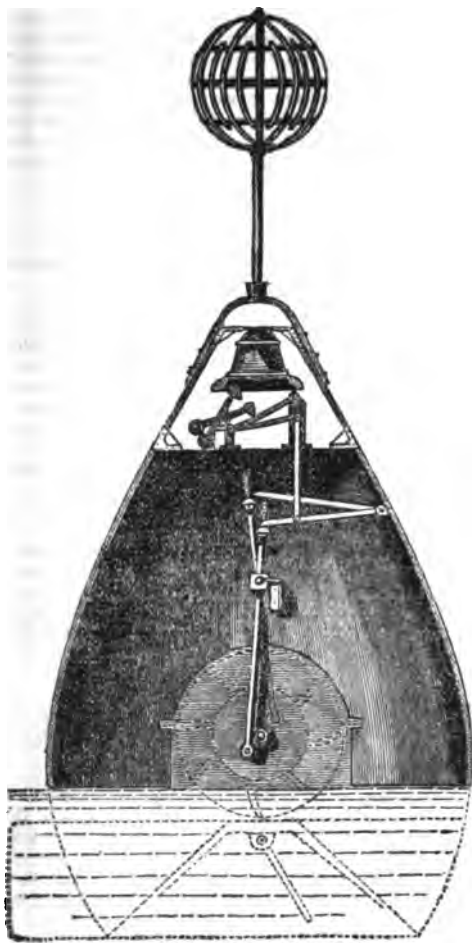
... and is, of course, placed in a convenient
... of a Dial
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... This unit is mounted on a ... as to bring any ... person, opposite to ... the apparatus. A ... the apparatus ... movement of the dial ... to the apparatus by ... with an ... the trigger/puller box ... is an index, or ... in the apparatus.

This invention consists in applying an under-
shot water-wheel, in the centre of an iron or
other hoop, through which a pipe or water-
course is made, the lower or downward portion
of the wheel being driven round by the water
passing through the trough. A stream of the
spindle of the water-wheel is a small wheel
works an apparatus arranged in such a manner

[illegible]

as to constantly ring a bell, which is fitted on the top of the buoy, so long as the current runs through the water-course. The alarm will thus be given to all vessels approaching dangerous reefs or shoals in tide-ways, in dense fogs, calms or dark weather, for upwards of 22 hours out of the 24. The same description of wheel can be fixed in a frame, and being thrown over the stern or side of a light vessel can be made to act in a similar manner.



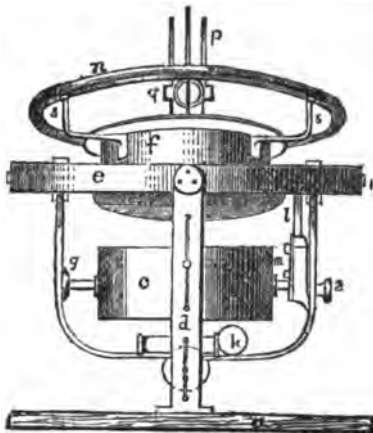
**129. Engine Room Telegraph; Perreaux and Co.,
and T. Suffield.**

This is for the purpose of communicating directly between the captain or officer in charge and the engineer.

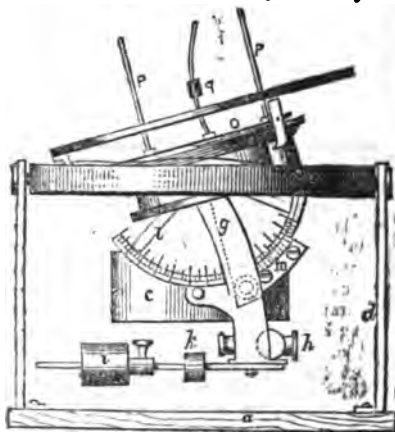
130. Patent Mariner's Time Compass; Ralph Reeder, 41, Southampton-buildings, W.C.

This instrument, which is a combination of a universal dial and chronometer, has been constructed to take any horizontal bearing in any latitude, at any hour of the day. It is also intended to solve those problems which can be solved by an armillary sphere, or by spherical trigonometry—so far as its circles and their

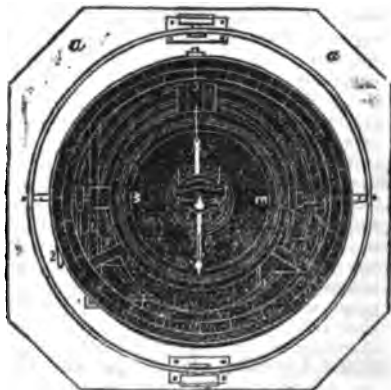
motions extend; and it will be also found to supply the place of the magnetic needle. For



taking an horizontal bearing in any latitude,
let the hour be what it may, it is only necessary



in the first place to bring the hand, with its two upright wire standards at the ends, to the true



apparent time; the instrument then being turned, till the hand points to the sun, gives the course. This hand is provided with a lens fixed in the centre, which takes the place of the gnomon of the universal dial, and is carried round by the chronometer once in 24 hours—

ASTOR LENOX TILDEN FOUNDATION
455 N. 5TH ST. NEW YORK, N. Y.
10017

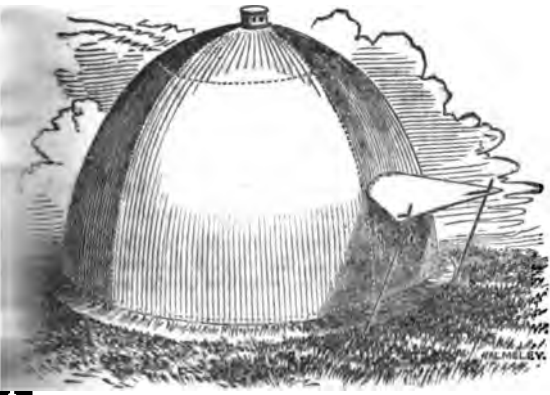


This apparatus is intended to be used on board sailing vessels during fogs at sea. When steering in one direction, by turning a handle a bell can be sounded, and when steering in the opposite direction, a very powerful rattle can be put in motion by turning the same handle, the bell ceasing to sound when the rattle is in action, and *vice versa*.

135. Self-acting Ice Indicator. Exhibited by N. M. Cummins, Annmount, Cork.

The object of this invention is to indicate to navigators the proximity of floating icebergs, when by reason of fog or darkness they are not visible. A small stream of water is allowed to flow into a vessel through a tube, in which a theometric rod is mounted. One end of this rod is fixed, while the other is free, it being intended by its contraction and expansion to work a lever connected with an alarum. The free end of the rod is jointed to the short arm of the lever, and thus the amount of its contraction beyond a certain limit is multiplied sufficiently to set the indicating apparatus in action. Whenever, therefore, the vessel approaches an iceberg, the inventor states that the decreasing temperature of the water in its neighbourhood (for a distance ranging about two miles) will cause the thermometer rod to contract and set the alarum in action.

136. Hospital and Field Tents; Capt. G. Rhodes, 94th Regt., Chatham.



The canvas of this field tent is supported by radial ribs, the upper ends of which are secured to a central head-piece, provided with sockets to receive them. The lower ends of the ribs enter loops in an endless circumscribing cord or ground rope, which is pinned to the ground by tent-pegs. The hospital tent is constructed on a similar principle, and may be made of any

required dimensions. A ridge-pole is introduced between two head-pieces, which are carried by radial ribs, and bent ribs are passed upwards from the looped ground-rope to fit into sockets attached to the ridge-pole. (See Drawings, Nos. 338.)

137. Military Field Stabling; T. D. Rock, 8, Napier-street, Wellington-street, Islington, N.

The model exhibited represents, on a scale of one inch to a foot—1. A waggon six feet high, to which the stabling can be attached. 2. Three tubes of galvanised iron, fitting into rings and sockets, each two feet above the top rail of the waggon. 3. Three tubes with solid points fixed into the ground, parallel to the last-named, at a distance of seven feet and a-half from the waggon, and standing six feet and a-half high. 4. Two tubes of eight feet in length, connecting each of the three uprights. 5. Three tubes eight feet and a-half long, uniting the uprights, fixed in the waggon with those at a distance of seven feet and a-half in the ground. 6. A covering of light water-proof canvas, enveloping the whole frame-work, and pegged to the ground like an ordinary tent. 7. A small tin manger, hung from the rail of the waggon, to hold the corn. By this arrangement on both sides of the waggon, four horses can be readily accommodated. On the march, the tubing and canvas are to be strapped to the sides of the vehicle. The additional weight per horse is about 32lb. The model shows the tent as erected for use, and as packed for transport.

138. Patent Mortar; Captain T. A. Blakely, R.A.

The peculiarity of this mortar consists in the whole being made in concentric layers, each slightly compressing that within it, so that when the strain comes, all may be strained nearly equally. In a cast mortar the interior must be strained much more than the exterior. It is stated that this arrangement gives greater strength at a cheaper rate, and affords facilities for making ordnance of a size hitherto found to be impossible.

139. Improvement in Fire-arms; Charles Farrow, 18, Great Tower-street, E.C.

This invention consists in attaching to the soldier's rifle a small instrument, which by the pressure of the finger, holds the end of the cartridge while it is torn off, thus obviating the necessity of biting it. The simplest form of this instrument is shown attached to an Enfield rifle, and models of other forms are also shown.

PHILOSOPHICAL APPARATUS, &c.

(For the remainder of the Articles in this Section see Drawings.)

150. Time Globe, or Planetary Clock; T. Sherrett, jun., 12, South-square, Gray's Inn, W.O.



This terrestrial globe rotates on its axis simultaneously with the pointer or hand, which makes one revolution before the 24-hour clock face in that time. Every hour is divided into 12 parts of 5 minutes each, the quarters and halves being more distinctly marked. The several portions of the day are also inscribed and coloured thereon, and the cardinal points given. In a right line with the pointer a black meridian passes over whatever place on the globe the time may be set for, showing it not only there but at all other places under the said meridian. On turning a button, which projects through the circular opening of the glass cover, it will cause the white meridian attached at the south pole of the globe to move over any place.

151. Patent Chronometrical Thermometer; W. H. Gauntlett, South Bank Iron Works, Middlesboro'-on-Tees.

This instrument is designed for the purpose of indicating the temperature of the atmosphere, and of permanently recording its variations upon a strip of paper by means of a marker. The strip of paper is rolled upon a drum, set in motion by clockwork. The marker obeys the impulse conveyed to it by the thermometric tubes, which expand or contract as the temperature varies. The strips of paper are ruled

with lines. The horizontal lines represent the thermometric scale, the vertical lines correspond with the hours of the day and night, as shown in the accompanying diagram. When the drum has completed its revolution, a line will be found inscribed on the paper intersecting the hour lines, and the thermometric lines also, if there has been any variation in the temperature, and this inscribed line will show what the temperature has been at any moment of the day or night. This instrument is specially applicable for horticultural purposes.

152. Astronomical Clock; Chr. Lange, 9, Salisbury-street, Strand, W.O.

This clock has a free escapement, with the pendulum suspended above the movement, the object of this being to make the pendulum more independent of the movement than usual. The compensation is so constructed that it can be regulated without difficulty. The suspension is so constructed, that, in case the suspension-spring should break, the pendulum cannot fall down.

153. Patent Reversible Hunting and Open-face Watch; F. B. Adams and Sons, 21, St. John's-square, E.C.

154. Time Indicator for use at night; Meyer Drukker, 47, London Wall, E.C.

This is an arrangement for showing the hour at night by means of the shadow thrown on to a scale, from an index attached to the weight of a clock.

155. Improved Surveying Level; Pastorelli and Co., 208, Piccadilly, W.

The peculiarities of this instrument are—an improved tripod or staff head; the substitution of a ball-joint and clamp for the ordinary parallel plate screw; an improved mode of suspending the telescope; the adjustments are rendered less liable to derangement; and there are improvements in the arrangement of the diaphragms.

156. Metford's Improved Levelling Staff; Pastorelli and Co.

157. Metford's Pocket Scales; Pastorelli and Co.

158. Improved form of Warrington's Microscope; Pastorelli and Co.

159. Set of Meteorological Instruments; Pas-torelli and Co.

This set of instruments consists of a barometer, maximum and minimum thermometers, dry and wet bulk hygrometer and rain gauge.

160. Froude's Proportional Compasses; Pas-torelli and Co.

The peculiarity of this instrument is this, that it can at once be set not only to any known ratio, but to any ratio which is not known, but which is only indicated by the length of two given lines; the instrument being set, the value of the ratio can be immediately ascertained by referring to a graduated scale.

161. Decimal Measures of Length; J. Simon Holland, Woolwich, S.E.

These measures are founded on the 16th of an inch as the basis. The two rules are marked with the present inches and eighths. The fathom measure is 1,000 "steens," or sixteenths, long, and intended for the use of surveyors, builders, &c. Ten of these new square fathoms coincide with the present rod of brickwork, or equal to 271.28 of the present square feet; and 1,000 of these new fathoms make a new mile, of which 69.99886 make a degree of the meridian. Bulk measures, founded on the cubes of these length measures, are exactly four times the French bulk measures. The new gallon will, therefore, exactly equal four litres. (See *Mechanics' Magazine* for March 27, 1858.)

162. Perspective Models; E. L. Paraire. Ex-hibited by George Rowney and Co., 51, Rathbone-place, W.

These models are intended for teaching the principles of perspective. The objects are solid, as in nature; lines passed from their various points represent visual rays, which intersect a transparent plane, portraying the picture, which corresponds with mathematical accuracy to the object itself, the manner of obtaining the vanishing points and other perspective operations being clearly shown.

163. Stereoscopic Camera; Alexander J. Austen, 2, St. John's-hill, Battersea-rise, S.W.

This camera is stated to possess the following advantages:—1. It can be worked without a dark room or tent. 2. It has a new arrangement for securing the bed of the camera being perfectly level. 3. It has a shutter instead of a cap, which can be opened and shut without shaking the camera. 4. There is an arrangement of various-sized diaphragms, on a circular disc, fixed on the camera, instead of loose ones. 5. It has an arrangement to enable the radius rods to be easily fixed, so as to obtain the coincidence of the two pictures, according to their distance, without the necessity of frequent shifting from side to side as at present.

164. Patent Dioramic Stereoscope; E. Erskine Scott, Dundee.

In this instrument the double eye-piece is so arranged that the rays from the two pictures

come to the eyes as if they radiated from a point of medium distance, such as that at which we are in the habit of looking at natural objects. This improvement is effected by using in the eye-piece two entire lenses, and placing their centres a little further apart than the distance betwixt the eyes of the observer, so that the rays from each picture are slightly refracted outwards.

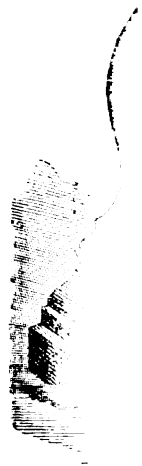
165. Polyorama Stereoscope; E. G. Wood, Cheapside, E.C.

This consists of an upright rectangular-shaped box, rising from an ornamented base, having at one side a sloping box, containing a pair of prismatic stereoscopic lenses. The top of the instrument can be raised to any required angle, and as the inside of this is lined with silvered glass, any required degree of light can be thrown upon the pictures, which are placed below in the axis of the lenses. Across the box is fixed a square block, reaching from side to side, and turned round by moving the brass head on the outside. This block, by means of a spring and notched wheel, can be moved exactly half of a revolution at a time. The pictures are formed into an endless band, and hang upon this block, and are brought in succession before the lenses.

166. Patent Photogen, or Light Generator, to be used for taking Photographs at Night; John Moule, Hackney road, N.E.

This apparatus consists of a convenient arrangement for burning pyrotechnic compositions for taking photographic portraits at night, at the same time preventing the noxious vapours from escaping into the room. The admission of air is so arranged as to prevent the vapours from obstructing the light emanating from the burning composition. The vapours pass from the top of the apparatus through a tube into a chimney.

150. Time Glob.
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The improvement in this instrument consists in the construction of the valves for changing the direction of the current of air from the main wind-way into the supplementary ones, by means of which the various intonations, termed the valve notes, are produced. By this arrangement of the openings in the pistons, the direction of the passage of the current through them in producing the valve notes is made so entirely to assimilate with that of the open notes, that the quality of tone and correctness of tune of these notes are identical.

170. Revolving Pianoforte Hammer; E. Thompson, Brigg.

The head of this hammer is circular, and is covered on every part of its circumference, in the same manner as the ordinary hammer is covered at the point which strikes the wire. When worn at one point it may be made to revolve on its axis, so as to bring another part into use.

171. Elliptical-fronted Pianoforte Keys; H. Brooks and Co., 31 to 34, Cumberland-market, Regent's-park, N.W.

AGRICULTURAL IMPLEMENTS, MACHINERY, &c.

(For the remainder of the Articles in this Section see Drawings.)

180. Patent Horse Hoe; John D. Garrett. Exhibited by Garrett and Sons, Leiston Works, Saxmundham, Suffolk.

The old arrangement for adjusting the mortice-bar by hand, or by hand and levers, is shown on one side of the model, and the improved method on the other; the latter shows the mortice-bar supported at its opposite ends, by joining to it pairs of pendent rods or levers, which, in proportion as they are opened out or brought nearer together, raise or depress the mortice-bar, and effect the desired change in the angle of inclination of the hoes. The raising or lowering of the mortice-bar is accomplished as follows:—the screw-shaft must be turned by means of the winch-handle, which projects beyond and in rear of the framing; the rotation of this shaft will cause the nuts on the pendent-rod or lever to approach to or recede from each other, and thereby increase or diminish the space between the mortice-bar and the framing of the implement, by which means the angle of the inclination of the hoes to the ground will be changed as desired. The principle of this hoe is, in all other respects, the same as was patented by Mr. Garrett, senior, in the year 1843.

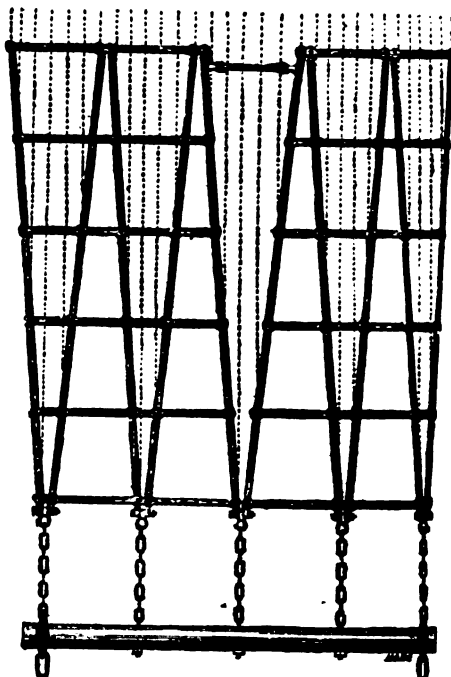
181. Agricultural Steam Machinery; William Hawkes, Eagle Foundry, Birmingham.

In this invention the tractile power acts, in a direct line, upon the implement to be moved, the engine being placed lengthways in the line of draught. Two drums, of large diameter, are worked alternately by a pinion being made to engage alternately in spur wheels on the drums. The implement is drawn backwards and forwards across the field by means of a rope or chain, working over a snatch-pulley attached to an anchor-carriage placed on the opposite side of the field. The engine is upon wheels at right angles to its longitudinal axis, and both the engine and anchor-carriage are moved, from time to time, by means of chains made fast at one end, and coiled over pulleys worked by the engine.

182. Model of a Farm, under Burcham's Circular Method of Tilling Land by Steam or Horse-power; C. Burcham, Heacham, Lynn, Norfolk, and 8, Upper John-street, Golden-square, W.

This system of agriculture subdivides the entire farm into small plots or circular allotments (either half acres or acres). A steam-cultivating platform is then made of a length suitable for executing any required operation by a circular sweep or ✓ each plot.

183. Patent Harrow; J. Emery.



The chief novelty in the construction of the harrow is in the wedge-like arrangement of the tooth-bars, and the mode of gearing them to the whippetree. All the teeth in the harrow are brought into longitudinal rows, in alternate cross parallels, a position that greatly favours an equal and effective action of the harrow on the soil. The arrangement also admits of a mode of gearing to the whippetree that every tooth in the harrow has the full force of the draught direct upon it. The model exhibited and the annexed woodcut, represent a light seed-harrow for one horse.

184. Patent Steam Cooking Apparatus for Cattle Feeding; George Forsyth, Stakelord Foundry, Dumfries.

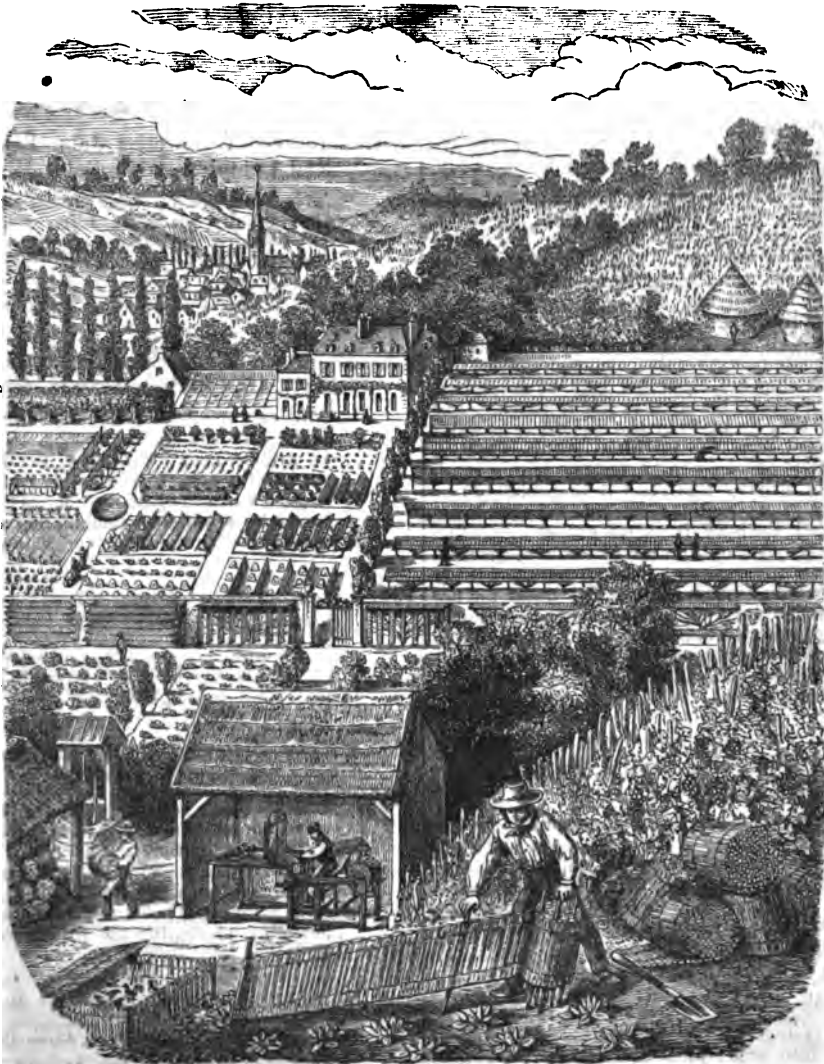
In this apparatus there are two boilers, the outer one being set in brick-work, in the usual manner, and the inner one of similar shape, but smaller, inserted inside it. Water is conveyed into the space between the two boilers, and the roots, or other food to be steamed, are put into the inner boiler, and rest on a perforated false bottom, and are covered close with a lid. Fire being applied, and steam raised (which will

blow off at a safety-valve when about 3lbs. pressure), it will pass to the under side of the false bottom, and rise through it to the roots. This boiler, when made large enough, will not only supply the steam necessary for preparing the food placed in it, but will also cook food, in a separate vessel, placed alongside.

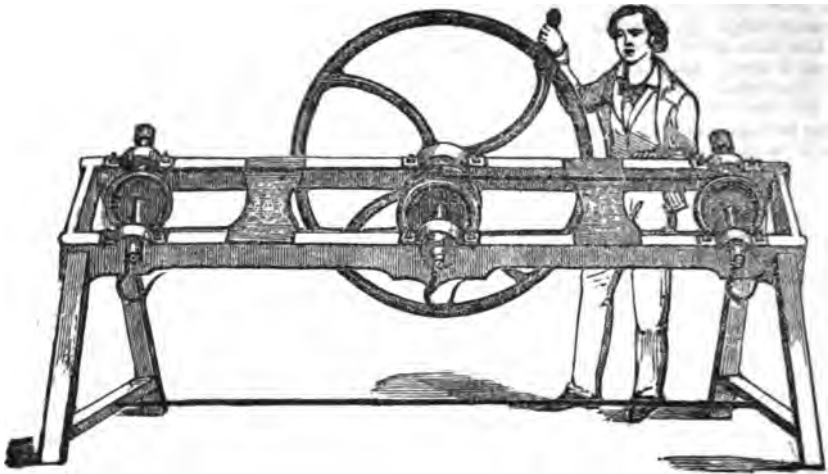
185. Dr. Guyot's Patent Straw Mat Weaving Loom; Agent, S. Sidney, 24, Great George-street, Westminster, S.W.

This apparatus consists of two parts, a frame and comb for separating the straw into the required quantities for the weaver, and a two-treadle loom, by means of which wires are bound round the straw, so as to form it into continuous

bands. This loom can be worked, after a few hours' practice, by a boy of twelve years old, or by a blind man or woman. The material, knotted together with iron wire, forms an endless roll of matting or thatch, which may be economically applied to all purposes to which hand-made straw mats or thatch are applied; to shelter fruit trees, or early vegetables or flowers, from frost—to rapidly cover ricks without the assistance of the skilled labour of the thatcher—to protect brick or stone work from frost during erection—to provide a cheap and rapidly erected shelter for ewes and lambs on open downs, or for live stock at agricultural shows. In France this machine has been found very useful, as producing a cheap protection for vines. The annexed woodcut shows a variety of applications of it.



186. Patent Straw and Hay-band making Machine; J. H. Simpson, Petersham.



This machine consists of an oblong cast-iron frame supported on four standards; in the centre of the frame a hollow shaft, with fly-wheel and double pulley, revolves in bearings. From the double pulley fixed on the shaft, power is taken, by means of bands, to two other pulleys of the same diameter, fixed on the hollow shafts revolving in bearings near each end of the framing. At the outer extremities of the shafts, are the hooks to which the hay or straw is attached. Under ordinary circumstances the hooks do not revolve, although the shafts to which they are connected may be revolving; but as soon as the straw or hay is attached, and the "drag"—made by the operator as he walks outward from the machine—put on, the hook is pulled outwards till it engages with a catch on the driving shaft, and it immediately partakes of its motion; on the "drag" being stopped, the hook is pulled out of connection with the catch of the shaft by means of a spring. By this arrangement three separate lengths of bands may be made, and as the hooks are not in motion when no bands are attached, should one operator be finished with his length before the others, he can commence a new attachment to the hook without necessitating the stoppage of the other two.

187. Patent Adjustable Scythe; James Payne, Kirkcudbright.

This scythe is adjustable by means of nuts and screws, and is so arranged that the blade will shut up like a knife. The short handles are moveable up and down the smith, and fixed at any particular place by simply screwing them round with the hand. (See *Practical Mechanics' Journal*, June, 1867.)

188. Horizontal Wind-mill; David Davis, Woodchurch, near Tenterden.

This mill has four horizontal sweeps, with shutters, which can be raised or lowered as to be driven round by the wind. Every quarter it may blow from

189. Improved Wirework; John Reynolds, 57, New Compton-street, Soho, W.C.

This wirework possesses greater strength than that usually made, it being made of hard twisted wire, and galvanised after being manufactured. It is intended for fencing of all kinds. From the way in which the twisted wire is interlaced, no other fixing is required.

190. Improvements in Stops for Gates; Andrew Scott, 15, Charlotte-terrace, Islington, N.

This gate stop is arranged so as to rise and fall as the gate is closed and opened. There is also an arrangement for closing the hole which receives the bolt, to prevent it from becoming clogged when the gate is open. This is accomplished by a suitable combination of gearing connected with the hinge and gate-post.

191. Patent Ledge Drain Pipes; John W. Milnes, 389, Strand, W.C.

These drain pipes are constructed with a ledge and tongue at the joints, so as to prevent the pipes from sinking unequally.

192. Patent Watering Pot; William Palmer, 156, Western-road, Brighton.

This invention consists in making the rose of a watering pot of an oval form with a convex surface, and perforating it with fine holes and attaching it obliquely to the mouth-piece. There is also a percolator, of a cylindrical form, with small holes, which is inserted in the flow-pipe, preventing the rose from becoming choked.

193. Bar and Slide Hive; W. B. Tegetmeier, St. James-lane, Muswell Hill, N.

This hive consists of two or more boxes, and is furnished with loose moveable bars, for the attachment of the combs, and slides. It presents all the advantages of an ordinary bar hive, with the great practical convenience attending the use

of slides. Two boxes are stocked with a swarm, the slides being withdrawn from the lower one, and, when they are filled, a third shallow box is placed above for virgin honey, and communication made by withdrawing the slides. The loose bars afford every facility for partial removal of honey, artificial swarming, and scientific observation, and the slides, which obviate the necessity for a cover, enable storifying, top feeding, and the removal of full honey boxes to be easily accomplished.

194. Stewarton Bee Boxes. Exhibited by W. B. Tegetmeier.

These hives are used extensively in Scotland. a swarm of not less than 5lbs. in weight, or two smaller swarms, being placed in two boxes. When both are filled, a shallower honey box is placed above to receive virgin honey, communication being made by withdrawing the slides of the middle box. In very productive seasons, a fourth box is required below.

BUILDING, SANITARY, AND DOMESTIC APPLIANCES.

(For the remainder of the Articles in this Section, see Drawings.)

200. Proposed Improvement of the Banks of the Thames; J. F. Wieland, Rosbank House, Port Glasgow.

These models are intended to show a section of the scheme proposed for an embankment of the Thames, a removal of the London sewage, an extension of the wharfs and quays, a new road from the west to the City, a subterranean railway from Charing-cross to London-bridge on the north side, and on the south side the same advantage except with respect to the railway, which would be one, as shown in smaller model, to connect the South-Western and South-Eastern Railways

201. Arch constructed of Patent Cement; C. C. and A. Dennett, Nottingham.

202. Improved Method of Laying the Footings of Brick Foundations; John Harrison, 3, High-street, Homerton, N.E.

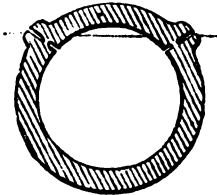
In this arrangement the external angle bricks are 9 in. square and $11\frac{1}{2}$ in. square, which prevents their being removed like the common 4-inch brick. The set-offs are made on every alternate course.

203. Patent Opercular, or Lidded Pipes; Henry Doulton, High-street, Lambeth, S.

The invention consists of two flanges, or ribs, running lengthways, and comprising about one-third of the circumference of the pipe; through these flanges a partial incision is made before burning, in such a manner that, at any time, by inserting a chisel in the groove, the segment included between the ribs can be readily detached, without any risk of fracture

or damage, either to itself or to the remainder of the pipe; and, after examination, the lid or cover so detached is easily replaced, and, from having been burned in one piece, this lid fits exactly into its original position. By this contrivance access can be obtained, if necessary, to any part of a drain, or even to the whole length if required, without in any way disturbing the pipes in their bed, or lessening their capacity: a junction can be inserted, or the lid of a pipe removed without fracture or injury, and this is effected without increasing the number of joints or allowing any escape of the liquid contents, or entry of the surrounding soil. The strength of the pipes is increased by the addition of the flanges or ribs.

WATER LINE WHEN OPEN.

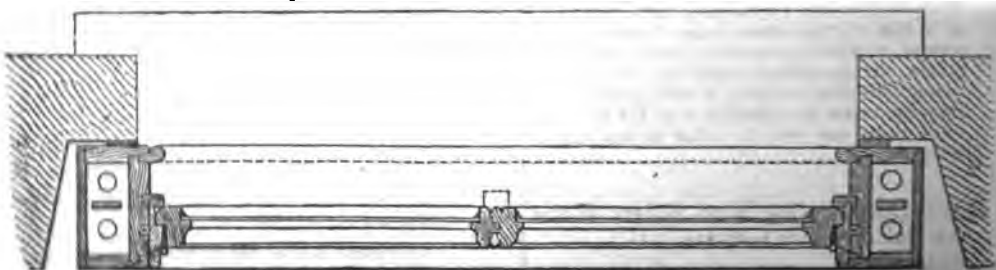


Cross Section.

204. Cleansing Tube for Drain Pipes; John Harrison.

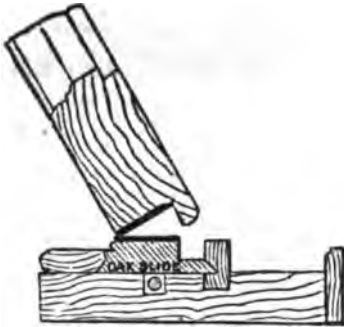
These tubes can be laid with the ordinary drain pipes at convenient distances, and have an opening in the side 20 inches long, covered with a complete flange, so that cement joints can be made. The sides of the tube are brought up sufficiently high for the complete diameter to be preserved.

205. Patent "Oak Hall" Window; West and Hnbbell, 25, Rupert-st. Haymarket, W.



HORIZONTAL PLAN.

In this window the upper half of the sash slides down to the bottom, and the lower part is in two halves, and may be raised as far as required, or opens up like a door. When



SECTION OF OAK SLIDE & BOXING

shut one bolt secures them all. They are so hung as to be less liable to accident than ordinary windows, as the sash cords, &c., are thoroughly protected from the weather.

206. Patent Self-Acting Sash Fastenings; J. Decimus Tripe, Commercial-road, E.

The peculiarity of these fastenings consists in their having a metal joint so constructed as to prevent rattling of the sashes, allowing a self-acting lever to lock the sash when the window is closed. A second arrangement consists of a self-acting lever, which, when placed in position on one sash, impinges against a stop or stops fixed at different heights on the stile of the other sash.

207. Patent Window Sashes; Dick and Co., 1, New Inn-buildings, Strand, W.C.

This is an arrangement for allowing the window sashes to be renewed or taken out for cleaning, &c., without removing the beading.

208. Improved Sash Window; Benjamin Shaw, Wellington, Salop.

This window is so arranged that the outside of the window may be easily turned inwards, so as to enable it to be cleaned within the room.

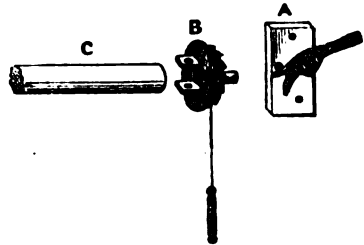
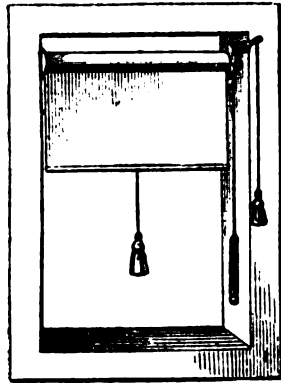
209. Patent Trellis Lath; Fairclough, Brothers, Liverpool.

This window lath, for hanging curtains, consists of a row of cross levers joined together, each portion of which opens and closes at equal distances, thereby giving regularity and evenness to the folds of the drapery in every position. It likewise raises the curtains from the floor and folds them one over the other in the middle when drawn.

210. Patent Elastic Spring Blind Roller; White and Bull, St. John's-square, E.C.

This invention consists of a pulley, having a drum smaller in diameter than the roller of the blind, and attached thereto by two arms, a ratchet being cut in the outer edge of the

pulley, for a catch to work in, which is fixed to the bracket, in which the pin of the roller revolves, a small cord being fastened to the drum of the wheel, and the other end attached to an india rubber spring, which is then fixed to the side of the window frame.



A. Bracket and catch. B. The Pulley-wheel, showing the method of attaching it to the roller by the arms. C. Portion of roller.

211. Patent Register or Chimney Valve, and Improvements in the Construction of Fireplaces; E. A. Spurr, 3, Newton-road, Bayswater, W.

The chief features of this invention are, a solid brick, arch-built, through the whole thickness of the wall, thereby adding to the strength, and removing one of the causes of a smoky chimney, viz., the large open space immediately over the fire; the commencement of the flue at the crown of this arch, and affixing to the lower part of it, either built into the brickwork or attached to the ironwork of the stove, a new kind of register or valve.

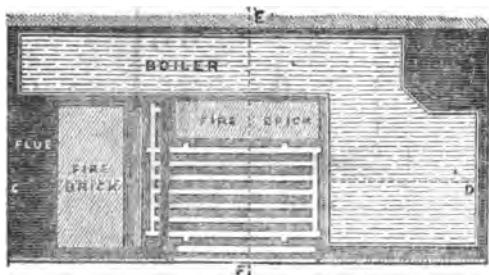
212. Improved Fire-Bricks; J. M. Paine, Silica Works, Farnham.

213. Improved Grate with porcelain sides, fire-brick back, and regulating damper; F. Edwards, Son, and Co., 42, Poland-street, Oxford-street, W.

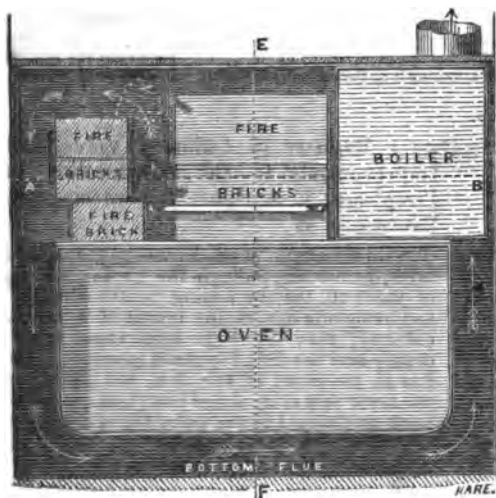
This grate is intended to show the application of porcelain to grates in the least expensive manner; the price of the specimen one shown, with either of the pattern tiles, being scarcely more than that of a common register grate.

214. Patent Economical Model. Lodging House Kitchen Stove; J. Candy. Exhibited by Wm. Addis, 6, Leicester-street, Leicester-square, W.C.

This stove embraces in a compact form an oven 18 inches long, 11 inches high by 14 inches deep, a boiler which will contain three pails of water, an open fire 7 inches long, 9 inches high, by 6 inches deep, the top of the stove forming a hot plate for the purpose of stewing, boiling, and heating irons. The stove exhibited is 24 inches long, 24 inches high by 14 inches deep.

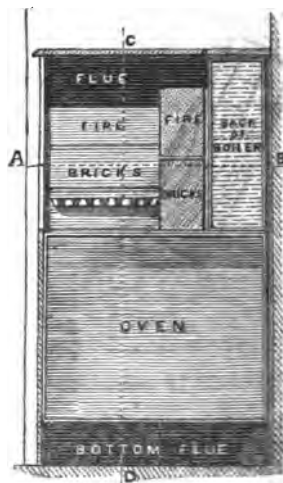


The above plan shows the arrangement of the stove above the oven. The fire-bricks which form the left-hand side and back of the fire-place are moveable in case of breakage; these bricks impart the heat they extract from the fire to the top of the oven.

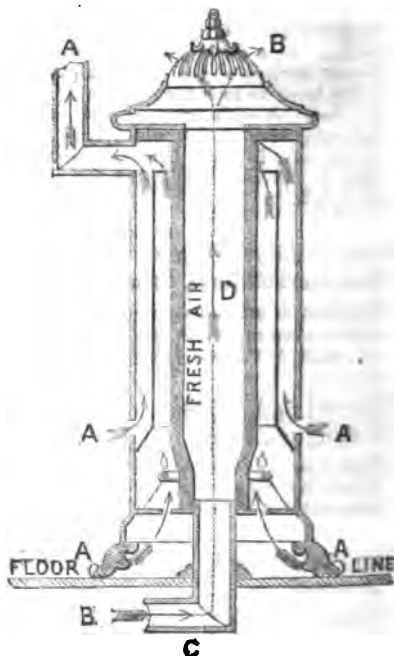


The above longitudinal section shows the action of the stove when the oven is in process of being heated; the arrows indicate the passage of the products of combustion over the bricks down the left-hand flue of the oven, under the oven and from thence up the right-hand flue into the chimney, by which arrangement the oven becomes equally heated over the whole surface. The following cross section shows the relative positions of the oven and boiler, also the construction of the fire-place from front to back. The 4-inch pipe which connects the stove with the chimney is fitted with a damper, to economise when the oven is not in use. A 24-

inch stove will cook 30 lbs. of meat, boiling vegetables, at the same time.



215. Patent Sanitary Gas Stove; J. Candy. Exhibited by Wm. Addis.



In the annexed woodcut, which shows a vertical section of the stove, the arrows A indicate the course the vitiated air of the room takes in its passage through the stove into the chimney. D the earthenware cylinder through which fresh air ascends into the room at a warm temperature; C the pipe to conduct the external air into the earthenware cylinder.

216. Deflagrating Gas Stove; F. X. Kukla, 14, Pentonville-road, N.

This is an adaptation of the principle of the Davy lamp to the construction of a gas stove.

217. **Opal and Coloured Glass Gas Fittings;** W. Reichenbach, 33 and 34, Borough-road, Southwark, S.E.

These glass fittings have metal tube linings, to give additional strength; the branches are also joined directly on to the stem, thus avoiding the necessity for the introduction of a dish as in the ordinary gaseliers.

218. **Patent Petrolene, or Liquid Gas Lamps;** Nibbs and Hinks, Hockley-hill, Birmingham.

This lamp is constructed to burn almost any description of hydro carbon; but that to which it is particularly adapted is "Young's Patent Mineral Oil." The cone and shade-holder are cut by machinery from one entire piece of metal, and the other parts are so arranged as to cause no accumulation of heat. This lamp can be lighted instantly.

219. **Deflecting Shade for Gas and other Lamps;** Nibbs and Hinks.



The lower part of this shade is of clear glass, and the upper part is coated with enamel; it is thus made to serve the double purpose of a shade and a deflector.

220. **Patent Crystal Lamp Burner;** Nibbs and Hinks.

This invention consists of a glass cone placed over the wick, which throws the oxygen into the flame at a higher point than usually done. Outside this cone is placed an ordinary shouldered chimney, the shoulder of the chimney causing a second current of air to be deflected to the flame at some distance above the cone. This second current of air is supplied through four slots in the glass-holder.

221. **Deflecting Ventilator;** Nibbs and Hinks.

222. **Smoke-preventing Chimney Cap;** Nibbs and Hinks.

223. **Makese Chimney Cap;** John Leighton, 40, Brewer-street, Golden-square, W.

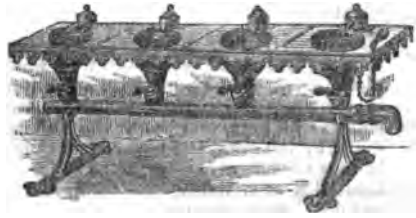
This is intended to prevent downward draught, and regulate the discharge of smoke.

224. **Chimney Top;** William Sandilands, Inveresk, Midlothian, N.B.

225. **Patent Burglary Detector;** T. Turner, Wolverhampton, and City-road, E.C.

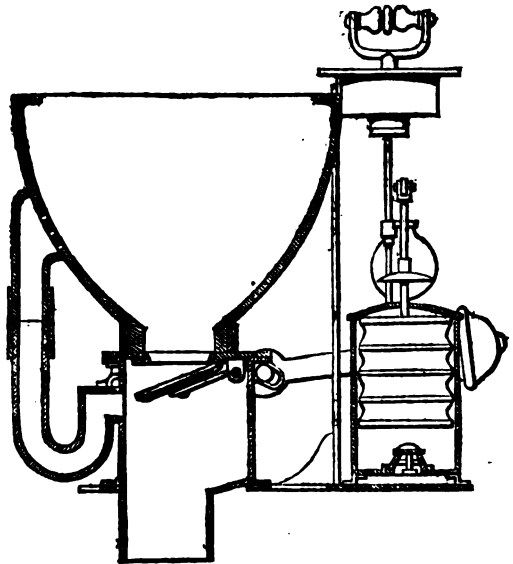
This apparatus is intended to be fixed upon the mantle-piece in a sleeping room. Wires are attached to it, and conveyed to doors, windows, &c., and there is an arrangement of cranks for setting a bell in action, as also for striking a light, on any entrance being made to the house.

226. **Patent Wash-hand Range;** Walter McFarlane and Co., Glasgow.



This apparatus consists of a range of basins, the whole being constructed of cast iron. It is intended for schools, reformatories, barracks, &c.

227. **Regulator Valve Closet;** Charles Botten and Son, Crawford-passage, Ray-street, Clerkenwell, E.C.



In fixing this closet, all that is necessary is to set it on an ordinary trap, bringing a supply pipe to the union of the valve. As no service-box, cranks, or wires, are required, this pipe may be branched from any main pipe in a building, and a number of closets supplied from one cistern, which may be at any distance therefrom. The bottom valve shuts against a ring of thick India rubber bedded into a metal seating, preventing leakage from unsoundness of valve. A perfect flush of water is obtained, no matter how carelessly the handle is pulled or suddenly let down.

228. Improved Water Closet; D. H. Lamb, Berwick.

This closet has the seat constructed like a chair, with an upright back for the support of the cistern, which cistern fills by a self-acting valve-tap for high or low pressure, each time the closet is used. The cistern cannot freeze, as it is always empty except when in use. It can give any quantity of water each time it is used.

229. Mode of Utilising and Deodorising Sewage Matters, &c.; Dr. John Lloyd, Llangefni, Anglesea.

This invention consists in applying the sifted ashes or breeze and the cinders from fire-places, alone or in combination with quick-lime, and in certain cases assisted by small quantities of chloride of lime, to remedy the nuisance produced by the sewage of houses, and thus reduce it to an inoffensive state, to be easily removable with such refuse, and so to be used as manure. The patentee proposes to use, inside of closets, &c., moveable metallic receptacles, of a square shape, divided by a partition, so as effectually to separate the solid from the liquid deposits. The ashes and lime rapidly solidify, and even fossilize the solid deposits, and convert them to masses without smell. The front compartment of the closet it is proposed should always, if possible, be partially filled with the mixture of lime and ashes. It acts in this manner:—the quantity of liquid passed into the closet forms a mass of wet lime, which acts in its well-known capacity of absorbing gases by deodorising any offensive smell. A great part of the liquid thus passed into the closet is at once absorbed, and any excess of it filters through the mass of lime and carbon, through a pipe to the sewer, and by so doing becomes divested of nearly all foreign matters, passing off as lime water, with only a very small proportion of impurities, and in a state that the ordinary putrefaction and smell are rendered impossible.

230. Improved Coal Cellar Plate; John Harrison.

Cross ribs are fixed on the under side of this plate which prevent it from being shifted without raising it sufficiently to clear the ribs.

231. Patent Marine Lock; W. P. Mills, Forest-hill, S.E.

This is a tumbler lock, so constructed that the mode of picking (by means of what is termed a double action) is prevented. It differs from all other tumbler locks in having the spring formed out of the tumbler itself.

232. Spring Lock; W. P. Mills.

In this invention the key hole is covered by a piece of card or soft metal, the catch of the bolt passing through a slot cut in it, and by means of a private mark at the back of this piece of card, papers or valuables under such security are prevented from being tampered with.

233. Patent Lock; W. Bond Paul, Langport, Somersetshire.

There are three important features in this lock. 1st. The bolt and tumblers cannot be reached simultaneously. 2nd. No impression of the tumblers can be taken whereby a false key could be made. 3rd. The bolt is not acted on directly by the key, so that the length of the bits has no reference to the distance the bolt is thrown, and consequently the key for any lock, however large, may be made conveniently small. This lock has a slide of peculiar form, and a second stump to the bolt. The key, which fits into a pipe, places the tumblers in the position for unlocking by passing under one end of them. To this pipe is fixed a lever which acts both on the bolt and the slide. During the rotation of the key, and consequently of the pipe, the slide is drawn over the tumblers and shuts off all access to them; the lever then passes on to the bolt, which can be reached by the lever only. The stumps are so placed that the lower one cannot be brought into contact with the tumblers until the other has entered a slot in the slide, which it cannot do whilst any part of the tumblers is exposed. The tumblers have all the same outline, so that when the bolt is locked they lie perfectly flush with each other. During the process of unlocking they are held up by friction.

234. Patent Invalid Bed; Wilson, Newton, and Co., 144, High Holborn, W.C.

This bed has a mechanism for raising the patient, to enable the bed to be made, as well as for placing him in any required position with the least possible inconvenience.



235. Invalid Couch; Thomas Greensacre, Mill-wall, Poplar, E.

This combines a bed, easy chair, leg-rest, &c. The back-board can be set to any angle. As the back rises or falls, the arms keep level. The leg-rests can also be raised or lowered either together or separate. The India rubber bed is made in separate compartments, so that its rigidity may be regulated.

236. Nightingale Bed; Thomas Dixon, 7, St. James's-place, Hampstead-road, N.W.

237. Stand for Cheval and other Dressing Glasses, Fire-Screens, Easels, &c.; Henry Dolman, 10, Nelson-street, Greenwich, S.E.

This invention consists of a hollow pillar rising from a base or foot; inside the pillar is a rod, on

the front of which is a toothed rack, which is worked upwards or downwards by means of a toothed wheel on a spindle, with a handle outside the pillar; the spindle is provided on the outside of the pillar with a ratchet wheel and fall, to keep the rod at the required elevation. The top of the rod is provided with a boss and cross-bar, acting vertically and horizontally, so as to place the glass or other object in any required position.

238. Patent Nursing-Chair; Wilson, Newton, and Co.

239. Exercising Apparatus for Infants; J. Clifton, 541, Oxford-street, W.

240. Music Canterbury, with Writing Desk; H. Brooks and Co.



241. Patent Dining Table Expander; Fairclough, Brothers, Liverpool.

This model shows a principle by which any length of table may be opened and closed by the application of a short screw. Nuts are fixed in the backs of the slides, and each one being acted upon successively by the turning of the handle the table expands to its full extent. In closing, each slide runs off on a neck at the head of the screw as the succeeding one is drawn up. The advantages possessed are that there is no weight of screw or tube in the centre of the table when opened; and, only one of the slides being acted upon at a time, greater freedom in working is secured.

242. Patent Mangling and Calendering Machine; J. Chedghey, the Grove, Southwark, S.E.

The peculiarity of this machine consists in the application of glass as its bed, the rollers being also made of the same material. The rollers, it is stated, have borne a pressure of 80 tons, and are ordinarily worked under a pressure of 10 tons. The reversing motion is effected by a lever and cam. A machine on this principle has been in use in the Queen's laundry for some time past.

243. Patent Glass Rollers and Cylinders; J. Chedghey.

244. Patent Box Mangle; Richard Howland, 3, Long-lane, City, E.C. Exhibited by Davies and Hunt.

The principal novelty is in the lift, which is self-acting, and is put in operation by pressing a knob in front of the frame, thereby obviating the danger of reaching over the mangle whilst it is in motion. The iron work is so arranged as to pack into the box for convenience of exportation.

245. Washing, Wringing, and Mangling Machine; Thos. Briggs, 173, Woodhouse-lane, Leeds.

246. Patent Washing Machine; J. L. Hancock, 62, Pentonville-road, N.

This machine consists of a water-tight case, in which rollers are placed near the bottom, carrying an endless canvass band, to which various loops are fixed. The articles to be washed are partly drawn through these loops. A third roller presses by its weight upon the top of one of the others, and consequently upon the articles as they travel round the band. The case is to be filled up to the lower edges of the rollers with hot suds; the articles should be soaped before being placed in the machine.

247. Spring Balance Washing Machine; Peter Gabbitass, Workop.

This machine consists of a cylindrical tub, a spiral spring, a wooden horse, and revolving knuckled rubbers.

248. Patent Washing Machine; Thomas Robson, 15, Critchill-place, Hoxton, N.

249. Knife-Cleaning Machine; G. Weadon, 41, Poland-street, Oxford-street, W.

250. Opal Glass Rails, for Counting-house Desks, &c; W. Reichenbach.

MISCELLANEA.

260. Patent Elutriator, for Decanting Wine, &c.; Charles Farrow, 18, Great Tower-street, E.C.
261. Patent Decanting Machines; Wm. Lund, Fleet-street, E.C.
262. Patent Rack Corkscrew; William Lund.
263. Patent Lever Corkscrew; William Lund.
268. Patent Bread-making Machine; E. Stevens, 5, 6, and 7, Cambridge-road, London, N.E.
269. Patent Mincing Machine; S. Nye and Co, 79, Wardour-street, Soho, W.

This machine consists of a series of blades placed upon an axis, and forming an endless screw. The meat is cut and forced out of the machine by one operation.



270. Apparatus for Beating the Whites of Eggs, &c.; E. P. Griffiths, 8 High-street, Cambridge.
271. Domestic Apparatus for Making Ice Creams; George Keith, Great Russell-street, Bloomsbury, W.C.
- This apparatus is to be used with ice and milk only.
272. Australian Freezing Apparatus; George Keith.
- This is intended for making a small quantity of dessert ice, by means of freezing mixtures, of ice and salt.
273. Domestic Coffee Roaster; George Keith.
- This is to be used on the top of an ordinary fire, with an arrangement for fixing it on the bars of a grate.
274. Toaster for Cooking; George Keith.
264. Patent Spherically-jointed Pocket Corkscrew; William Lund.
265. Patent Clips for Holding Papers, Music, &c.; William Lund.
266. Fastenings for Bullion Boxes; William Lund.
267. Patent Bullion Box; Samuel Montagu.

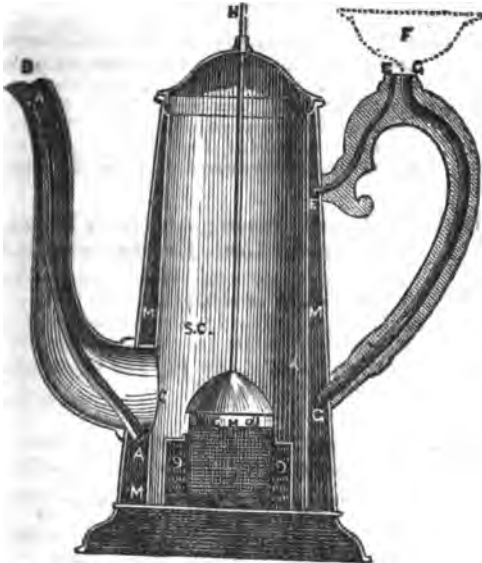
The object of this invention is to prevent the withdrawal of the contents of the box without detection; this is effected by grooves being made near the edges of the box into which iron plates are driven. When the plates are on the box nails are driven through them, indenting the iron into the wood, and preventing the plates being forced off without so injuring them and the box as to render it impossible to replace them. The ends of the boxes are dovetailed, and spaces left between the plates, so as to prevent any attempt at sawing out the sides along the grooves.

275. Patent Double Chamber Coffee Pot, for holding Milk and Coffee in separate Compartments; W. H. Myers, 202, White-chapel-road, E.

This coffee pot is formed by a case fixed within a case, the inner one holding the coffee, the outer one the milk; at the bottom of the inner case is formed a perforated compartment to receive the holder, having a connecting rod attached to it through the top of the pot, in which

holder the ground coffee is placed; inside this holder can be placed an Archimedean screw by which chocolate can be torn to pieces and agitated. The heat, instead of radiating from the sides of the pot into the air, goes into the milk, warming it previous to its being poured out. The same application is made to tea-pots, for holding milk and tea in separate compartments; and, in a modified form, for spirits and water.

FIG. 1.

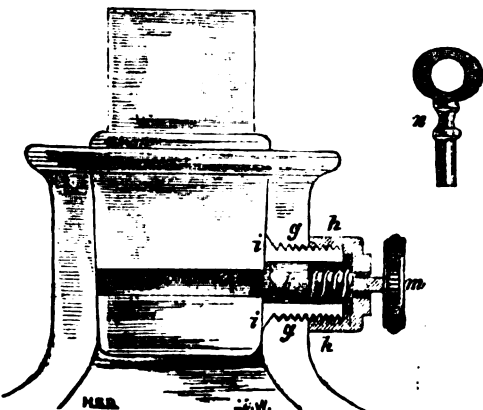


S C Inner Case for Coffee. M M Outer Case for Milk.
C H Perforated Holder or Strainer for Ground Coffee.
T The Lid which forms F the Funnel. G Milk Inlet.
A A Milk Outlets. D Coffee Outlet.
B Inlet and Outlet for Air. H Connecting Rod.
P P Perforated compartment for Coffee Holder.

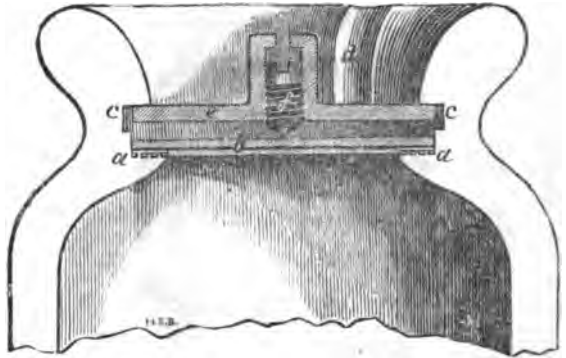
276. Improved Kettle; Taylor and Rolfe, Northill, Bedfordshire.

This kettle has a concavity at the bottom, within which are several tubes, through which the water circulates.

277. Patent Locked Poison Bottles, Locked Airtight Jars, Spirit Bottles; Stevens and Fitch, 56, Great Queen-street, Lincoln's-inn, W.C.



The annexed woodcut shows the construction of these bottles, &c.; *k* is a bolt or plug passing through a tube *gg*, secured by a cap *aa*, with an eyelet or key-hole; *m* a moveable key that screws on the bolt *k*; this bolt being pointed to lodge in groove *l* in stopper *u*, by pulling the key in an outward direction, it forces back the coiled spring on bolt *k*, and allows the stopper to be removed; placing the stoppers in the bottles forces the spring back and locks itself; the key being unscrewed, the contents of the bottle are secure. As merely placing the stopper in the bottle causes it to lock, it is evident the spring must be drawn back every time the bottle is used.



In the mouth of the jar, the ledge *aa* receives a lid or cover *b*, with a layer of cork on the underside; the bar *e* is passed into the mouth of the jar by means of the slot or opening *d*; when turned onwards to the groove *cc*, it is in its place. The screw *f* is worked up or down by means of a key passing through a key-hole on the top of the bar and fitting to the screw; screwing down forces the cover *b*, and imbeds the cork on the ledge *aa*. Working the screw up, relieves the bar, and it may be moved round to slot *d*, and taken out.

278. Patent Cornucopian Feeder; Henry Edwards, 1, Bishopsgate-street Within, E.C.

This invention is intended for administering food or medicine to the sick or to children. It is also applicable for giving medicine to cattle. A patent air stopper is adapted to it, which regulates the flow of liquid.

279. Patent Arabica (I lentilised) Cocoa; Samuel Riley, Stamp Office, Oldham.

This article is mixed with lentils in lieu of the flour of wheat, rice, sago, tapioca, and arrowroot, the ordinary ingredients of the best commercial cocoas. Its chief property consists in its possessing a large amount of albuminous matter in proportion to that of oily matters.

280. Postage Stamp Distributor; S. Denham, Wakefield. Exhibited by Thos. G. Iveson, 60, St. Peter's-road, Mile End, E.

This instrument is intended for the delivery of postage or other stamps singly to purchasers, so as to dispense with the attendance of an official for the purpose at post and receiving offices. One penny being put into

the hole near the top, unlocks the instrument, and allows the handle on the left to be pulled out; this, on being pushed in, sets in motion two rollers, through which a string of stamps passes from a supply roller, forcing out one to be pulled off. One stamp only can be had at a time, and halfpence or smaller coins are rejected.

281. Patent Letter Copying Press; William Muir and Co., Britannia Works, Manchester.



In this press the stand and press are made in one piece, so that the complete machine can be made at less cost than hitherto. This arrangement is found advantageous for exportation, as no timber is used. The legs can be easily taken off, so that it may be packed in a small compass.

282. Patent Ready Index Ledger; J. Raven and Co., 46, Fish-street-hill, E.C.

283. Patent Pocket Watch Fastener; Robert Mair, Edinburgh.

This consists of two segments of thin steel, fitting round the periphery of the watch, and intended to be worn in the pocket. There is an arrangement of hinges and a catch, by which the watch may be released when required.

284. Patent Lock for Brooches: John Long, Tiverton.

In this arrangement a spring catch passes over the end of the brooch pin, and must be drawn back by the finger in order to unfasten it.

285. Osmont's Patent Pocket Reservoir Penholder. Exhibited by E. Stevens, 5, 6, and 7, Cambridge-road, N.E.

The penholder in this case becomes the reservoir for the ink. Within the holder is a double

threaded screw upon which a piston works. By turning this screw so as to draw the piston up the holder, the reservoir is charged with ink, which is supplied to the pen as required by turning the screw and driving down the piston.

286. Fountain Pen; J. Needham.

This pen-holder consists of a tube, having a cap, which, when screwed on, is ink-tight. At the opposite end is a conical nose-piece, in which the pen nib is enclosed. The nib is fixed to a stem having a helical spring coiled round it, which presses against a shoulder on the stem, a little larger than the internal diameter of the nose piece; this forms a valve, keeping it tight. When in use, the point of the pen is pressed inwards, thus opening the valve and allowing the nose-piece to be filled. When the supply is exhausted, the pen is again rudimentarily pressed inwards to renew the supply.

287. Steel Parasol Frames; Alexander Porecky, 7, York-street North, Hackney-road, N.E.

These frames are made in two ways; either the alder and stretchers and the pivots by which they are joined to the ribs, may be made in one piece, while the ribs are joined by a perforated ring; or, the ribs and top-ring may also be made in one piece.

288. Patent Vest Shirt; Robert Atkinson, 1, St. Nicholas-square, Newcastle-on-Tyne.

This consists of a waistcoat-front combined with an ordinary shirt.

289. Patent Lignite; D. J. Walton & Sons, Haughton Dale Works, Denton, near Manchester.

This composition is a combination of resins and fibrous substances, and is remarkable for hardness, polish, and durability. It is applicable for various purposes, amongst which may be named furniture fittings. The polish is natural, no surface layer of polish being applied; it is also perfectly waterproof when laid on wood, cloth, &c. Specimens of various articles made of this material are exhibited.

290. Patent Method of Wrapping Needles. Richard Bennett, Redditch, Worcester-shire.

291. Double Spring Hooks and Eyes; G. F. Pennell, 27, Buckland-street, New North-road, N.

In these hooks and eyes, the ends of wire, forming the ears of the eyes, are made to pass over the back of the eye and act as springs on the back of the hook when in the eye, and so hold it in its proper place. The ends that cover the eye are planished inside to facilitate the introduction of the hook.

292. Patent Compressed Tooth Powder; Arthur Dunn, Dalston.

This powder is compressed in an iron mould, and is protected by a metallic covering from the action of moisture, &c.

293. Bowler's Mechanical Boot Stretcher; J. Sparkes Hall, 308, Regent street, W.

This is an arrangement for stretching a boot at several distinct points, as shown in the annexed woodcut. The bosses by which the stretching is effected are forced outwards by a screw-acting in the interior of the last.



294. Patent Brown Enamelled Leather Boots; Bowley and Co., Charing Cross, W.C.

These boots are specially intended for use in hot climates.

295. Patent Self-supporting Stocking; Frederick Ayckbourn, 4, Lyon's-inn, Strand, W.C.

For these stockings the garter, which is in the first place made separately and expressly for the purpose, is afterwards incorporated into the stocking in the process of manufacture.

296. Patent Swimming Propellers; John Cox, Edinburgh.

This propellor is to be attached to the leg, and acts upon the principle of the webbed feet of aquatic birds, collapsing when drawn up, and expanding when pushed against the water.

297. Double-Revolving Electro-Plated Fish-Hook; W. H. Box, M.D. Exhibited by Thomas Hemming and Son, Victoria-place, Redditch, Worcestershire.

The peculiarity of this hook consists in the application of a double swivel to the box to which the hook is directly attached by means of a knob, or pin-like head, so that it turns round without slipping through the box, while the upper part is completed by the usual round eye, or one of an elongated figure fitted with a spring, which, thus combined, allow the hook to make a double revolving action. It is also electro-plated with silver, and its appearance is rendered so attractive in the water, that it has been found to take certain fish without being baited. The hook is also supplied with a nuzzle of brass wire, of thirteen or fourteen inches in length, on the top of which is another swivel like the former, with a round eye for attaching the line, and with its lower end turned up in the shape of a noose, by which means it may be slipped off or on to the hook with perfect ease.

298. Parchment Address-band for Carpet Bags; W. H. Merle, 20, Prince's-terrace, Hyde-park, S.W.

On the card-plate or frame, either of brass or leather, the permanent address is written. At

each end of this, and under the frame which holds the card, are two openings, through which a slip of parchment is passed, upon which any number of addresses may be written, and by drawing along the band these may be shown as required.

299. Patent Fibre obtained from Wood, and Paper made from it; J. C. Martin, Fern-cottage, Charlewood-road, Putney, S.W.

This fibre is manufactured from short or waste ends of wood. The three varieties of paper exhibited are made wholly from the fibre without the removal of the short pieces which it contains, and without the admixture of any other description of pulp or size, the natural resin contained in the wood being so treated as to form size.

300. Specimens of Plastic Wood, or an improved description of Papier Maché; J. C. Martin.

The specimens shown are an inkstand, a mask, a corner piece, a bracket, and a book cover. This substance is stated to be applicable as a substitute for wood carvings, as it admits of being moulded to any required form. It can also be worked or polished similarly to wood, and can be so treated as to resist moisture. It will not warp by exposure to heat.

301. Specimens of Fibre, Paper, Card, Mill-board, and Pulp; W. G. Plunkett, and John C. Bower, C.E., 4, Belvidere-place, Dublin.

The specimens exhibited are the following—1, Handmade paper, card, and pulp of the "Iris pseud acorus" or common yellow flagger; 2, Washed fibre of the "Lavatera Arborea" or tree mallow; 3, Hackled hemp from do.; 4, Pulp of fibre or hemp; 5, Card and boards made from the wood of the "Lavatera Arborea;" 6, Millboard, from the small branches of the "Lavatera Arborea;" 7, Card from fibre of Lavatera Arborea; 8, Boiled and "washed fibre of the Bine" of the "Humulus Lupulus," or common hop plant; 9, Pulp made from do.; 10, Paper, card, and board from do.; 11, Pulp, paper, card, and board, made from the "Trifolium Rubens," or red clover; 12, Fibre of the "Iris pseud acorus," or yellow flagger. The foregoing unsized specimens have all been handmade. The "Iris pseud acorus," or common yellow flagger, is indigenous to Great Britain and Ireland. It produces, from the dried plant, from 60 to 70 per cent. of a strong fibre, (No. 12.) The "Lavatera Arborea," or sea tree mallow, produces a large quantity of fibrous matter, and, if properly cultivated, might, in the opinion of the exhibitor, be the means of turning the vast tracts of bog and waste lands in Ireland to a valuable account.

302. Improved Paper File; J. Faulkner, 62, St. Martin's-le-Grand, W.C.

This file is to be screwed against a desk or partition. The improvement consists in the addition of the upper horizontal guard of brass, for the prevention of accidents.

303. Patent Glass Birdcage; F. Ayckbourn, 4, Lyons Inn, Strand, W.C.

DRAWINGS.

310. Patent Syphon Smokeless Air Furnace; Major Vandeleur, R.A., Royal Arsenal, Woolwich, S.E.

The fireplace of this furnace in its longitudinal section much resembles an inverted syphon. The coal is thrown on at one end of the syphon, and the flame drawn out at the other. Two currents of air are made to pass diagonally through the fire, and uniting at the lower point of the arch, form an intense and perfectly smokeless flame.—(See *The Times*, March 2nd, 1868.)

311. Patent Conical Flue, and Double Chimney Steam Boiler; R. Morrison, Ouseburn Engine Works, Newcastle. Exhibited by W. and J. H. Johnson, 47, Lincoln's-inn-fields, W.C.

312. Improvements in the Generation of Steam, &c.; George Scott, Philadelphia, U.S. Exhibited by Galloway and Sons, Manchester.

This invention consists in injecting into a heated metallic vessel atmospheric air and water commingled, the water in the form of spray. This is stated to produce a greater amount of mechanical power with a given quantity of fuel than steam generated from water alone.

313. Slide Valve.; Charles Botten and Son, Crawford Passage, Clerkenwell, E.C.
See Model, No. 20.

314. Patent Indicator for Registering Pressure; Thomas Baldwin, Corn Market Buildings, Bury, Lancashire.

By this instrument (Figs. 1 and 2) may be ascertained whether the engine has a constant or variable velocity, or a constant or variable pressure acting on the piston. The action of the governor of the indicator upon the measuring apparatus is such as to cause it to measure a pressure proportionally *greater* when the velocity increases, and proportionally *less* when the velocity decreases, than the true pressure which is measured when the velocity is constant. The sum of these pressures being multiplied by the constant velocity (the velocity at which the instrument measures true pressure) will give the force exerted by the engine during the time it has been in motion. The shaft T is connected to the registering apparatus for mean pressure, and the shaft O to that for indicating the revolutions. The dotted lines show the position taken by the instrument when the pistons move up or down. Figs. 3 and 4 represent an instrument for registering pressure without the use of springs. When the steam from the engine enters the cylinders of the instrument, the cy-

linder which receives the greatest pressure will have its piston moved in an upward direction, at the same time the float attached at the same side of the centre of the beam will move also in an upward direction, but the other piston and float will move in a downward direction. The mercury contained in the vessel wherein the float moved upwards will descend, while the mercury contained in the other vessel will ascend; and the column of mercury above the bottom of the descending float will be greater than the column above the ascending float; and the difference between the height of the two columns multiplied by the area of the bottom of the last C, and by the distance of the centre of the cylinder from the centre of the beam, will be always equal to the difference of the pressures acting in the cylinders, multiplied by the area of the piston A, and by the distance of the centre of the float on the other side of the beam from A. If the greater pressure be put into the other cylinder the operation will be reversed. The last named instrument may have the measuring apparatus of Figs. 1 and 2 attached. Each instrument is adapted to take diagrams from the cylinder of the engine.

315. Patent Speed Regulator; Biggart and London, Dalry, Ayrshire. Exhibited by W. and J. H. Johnson.

316. Mercurial Alarm Steam Pressure Gauge; J. G. Jones, 2, King's-parade, Chelsea, S.W.

This invention consists in so constructing mercurial steam pressure gauges that they shall give an alarm at any desired pressure; and in preventing the waste of mercury by its being blown out of the tube by any sudden increase of pressure in the boiler, as is often the case with the gauge now in use; and also in preventing water accumulating on the surface of the mercury, which gives a false indication. The drawing shows the manner in which this is accomplished. Figure 1 is a longitudinal section. A is a bent tube (the same as that composing the common gauge), which is bolted to the boiler at A¹. The tube (A) communicates with a vessel or receiver (B) by means of a branch pipe (B¹) on to which the graduated scale (C) is screwed, closing its end, and thus preventing any water getting into the tube (A). It will be seen that should the pressure of steam in the boiler exceed the weight of the column of mercury in the tube (A), the mercury will be forced out of the tube into the vessel or receiver (B), leaving a free passage for the steam from the boiler to the whistle (D), as shown in Figure 2, which will give an alarm, calling the attention of the engineer to the state of the boiler. The instrument can be readily re-adjusted, by opening the cock (E), and allowing the mercury to flow back into the tube (A).

317. Patent Fluid Pressure Regulator; Guest and Ohimes, Rotherham. Exhibited by W. and J. H. Johnson.

318. Patent Steam Engine; Thomas Moy, 1, Clifford's-inn, E.C.

In this engine, the boiler is of tubes of small diameter, and consequently of great strength. The water is pumped into the tubes, and the heat applied externally. The heated water is kept in constant circulation on the well-known Perkins' system. No steam is allowed to form in the boiler, the pressure being kept so as to prevent the formation of steam in the boiler, at whatever temperature it may happen to be working. The cylinder is furnished with a jacket, in which the water circulates, and this jacket, as well as the valve box, is always in communication with the boiler, the circulation being uninterrupted, whether the engine is at work or at rest. The valves are so formed that the attendant can regulate the power of the engine at pleasure. The valves measure off and deliver to the cylinder, each time they are reversed, a certain quantity of highly-heated water, which will turn into steam, partially upon its entry, and partially after it has entered the cylinder. It is well-known that the sensible heat and the latent heat of steam, at any pressure, being added together, amount to 1,212°; therefore, the higher the sensible heat, the smaller is the quantity of latent heat. Suppose, then, a certain portion of water to be delivered to the cylinder, at the commencement of the stroke, at 1,000°, almost all this water will become steam of very great pressure; no more water being allowed to enter, this steam will drive the piston with a constantly diminishing force. But the remaining quantity of water will require to be turned into steam before the end of the stroke. This will be accomplished by the heated jacket of the cylinder, because, in consequence of the continued expansion of the steam, the heat of the jacket will be far higher than the attenuated steam would require, and the whole of the water becomes steam before the completion of the stroke of the piston. The steam, after having performed its work in the cylinder, passes into a surface condenser, to be re-converted into water, and pumped back into the boiler. A self-acting apparatus keeps the boiler always properly filled with water.—(See the *Mechanics' Magazine*, Feb. 6, 1858.)

319. Patent Steam Engine Blower Pump and Meter; Robert Barclay, Montrose.

Steam enters by the sliding abutment C (Fig. 1), which is divided into two compartments, and is conveyed, through a slot in its upper side, into the working chamber formed betwixt the outside fixed cylinder A, and the uppermost side of the rolling cylindrical piston B. The exhaust steam escapes by a slot in the lower side of C. A (Figs. 1 and 2) is a fixed metal cylinder truly turned inside, resting on the metal platform K. B (Figs. 1 and 2) is a metal cylinder, truly turned outside, and on the projections on the inside; it is free to roll around the inside of the fixed cylinder A. The plain rollers D, D¹, and D², roll upon the projecting parts inside B, and being keyed upon the main shaft F by the bracket E, (Fig. 1), they keep the rolling piston B tight

against the fixed cylinder throughout the revolution. D is a double roller (Fig. 3). D¹ receives the pressure of the steam, and communicates the power to the main shaft, causing it to revolve. D² steadies and reverses. The end covers, H and H¹, (Fig. 2) are required to complete the steam working chamber. H¹ is adjusted in its pressure upon the end of the rolling piston by sets of screws in pairs, working on the circular piece J; one screw of a pair pinches the cover down while the other draws it up, thus the most perfect freedom of movement consistent with steam tightness is attained for the rolling piston. The sliding abutment C, which divides the fresh from the exhaust steam, is kept tight against the side of the rolling piston B, by steam having access to the small chamber on its head. F, the main shaft, runs in bearings on the metal platform. As a blower pump or meter the mechanism is greatly simplified. The movement of this engine is perfectly smooth, the whole mass moving in one direction. A rubbing point on the end of the rolling piston makes a very short travel, about 13 inches per revolution, as compared with about 50 inches in an ordinary reciprocating engine of same power. It can be so arranged that a rubbing point shall not pass over the same line in many thousand revolutions; unequal wear of the rubbing surfaces is thus saved. Friction is reduced to the minimum by adjustment of the end cover. A very high speed can be attained without the loss of power attendant on a heavy reciprocating body moving at a great velocity. Two of these engines bolted together, actuating the same shaft, are said to give out precisely the same power at every point of the revolution.

320. Patent India-rubber Accumulators, as applied to Boring Rods; R. E. Hodges, 44, Southampton-row, Russell-square, W.C.

The drawing shows a "compound accumulator," composed of 60 "simple" accumulators, held together by a pair of shackles. Each of the 60 is $\frac{3}{4}$ -inch diameter, 18 inches long, and equal to 56 lbs. when stretched to 7 $\frac{1}{2}$ feet. Any portion of the 60 accumulators can be used in the shackles, to suit the weight of the rod, but when the whole 60 are attached, the power of four men will work a rod of 30 cwt. through an 8-inch stroke. They are also useful for a cable and towing spring, and for driving machinery, &c., &c.

321. Morris's Patent Improvements in Joining, Securing, and Supporting the Rails of Railways. Exhibited by F. W. Campin, 166, Strand, W.C.

The arrangements shown by the drawing exhibited consist of what the inventor terms "high-backed chairs," on which the rails are secured. In the two arrangements shown at the foot of the drawing, the securing the rail to the chair is effected by screws passing through the "high back" or ridge of the chair, the rail, a side-plate, and nut, a key or wedge in the lower part of the chair being added for ensuring a firmer joint. In the arrangements shown by the figure at the top of the drawing, although the chair is a "high-backed one," somewhat similar to others, it has no screws or nuts for securing

rail in the chair, the plan here adopted being to bring two ends of rails together in the chair, and to drive up tightly the peculiar-shaped key or wedge shown.

322. Patent Railway Chair; R. J. Badge, Manchester.

See Model, No. 43.

323. Railway Crossings; Irlam and Bethell, Gibraltar Iron Works, Manchester.

The crossing is constructed of a compound cast-iron chair, that portion of the wing rail upon which the rails can never run being cast to the same. Those parts which are subject to all the wear and tear are square bars of iron, steeled on the surface, and being short pieces inserted firmly in the chair, offer great facilities for steeling. These pieces, when worn down, are easily taken out, and at a small cost re-steeled.

324. Railway Turntable; Irlam and Bethell.

This invention consists, first, in making the outer or guard of wrought-iron plates, instead of cast-iron; secondly, in rivetting or otherwise attaching chairs to such guard, to support the annular rail for the turntable to revolve upon, or in attaching the rail to the guard by other means; thirdly, in making the platform or revolving part of the turntable of an outer ring, connected by wrought-iron girders, which girders support the chairs for the cross rails.—(See the *Engineer*, 21st August, 1857.)

325. Railway Turntable; Irlam and Bethell.

This turntable is constructed principally of wrought-iron, and when not required to be turned rests on a solid bearing, immediately under the line of rails on which the trains run; and when required to be turned, the centre is raised by a few turns of the handle, so that the weight is supported by the centre pin; this is steeled and hardened, so that the friction in turning a heavy weight is very slight. By turning the handle the contrary way, the centre is lowered, and the table rests upon its solid bearing, and is then as firm and steady as the permanent way.

326. Patent Railway Turntable; Thos. Richardson and Sons, Hartlepool Iron Works, Durham. Exhibited by W. and J. H. Johnson.

327. Patent Railway Brake; J. Sutherland.
See Model, No. 63.

328. Patent Bedplate Iron Solid Sleeper Permanent Way; Thos. Wright.
See Model, No. 50.

329. Lighthouse and Sea-coast Mariners' Refuge; J. S. Morris, 8, Earl-street, City, E.C.

The foundation of this building is proposed to be of wrought-iron piles, the superstructure being in the form of a cone, formed of wrought-iron

bars, crossing each other diagonally, and forming a trelliced conical structure of great strength, and offering but little resistance to the waves. The dwelling and light apparatus is cylindrical, and suspended in the frustum of the cone in such a manner as to retain its perpendicular position, under an alteration of that of the cone to the extent of 15 degrees.

330. Bell Buoy; George Chowen, Marystowe, near Launceston.

This buoy is so constructed as to be susceptible of the slightest motion of the waves, and in rough weather the bell will be continually ringing. The inventor proposes that buoys of this construction should be placed near the Goodwin Sands for the prevention of casualties.

331. Straight-timbered Ship, with Diagonal Planking; T. S. Henzell, Howdon-on-Tyne.

In this arrangement the timbers are almost entirely straight, with diagonal planking of the whole height of the vessel. This is stated to afford increased strength.

332. Patent Iron Masts; Finch and Lamport.
See Model, No. 116.

333. Patent Perforated Paddle-wheel Float; H. D. Deane, 18, Pigot-street, East India-road, Limehouse, E.
See Model, No. 113.

334. Adjutant Helm; Colonel Daniell, Donington-park, near Derby. Exhibited by John Gedge, 4, Wellington-street South, Strand, W.C.

This invention affords a means of communication from the bow of a vessel with the steersman at the helm. The apparatus consists of an upright revolving shaft at bow and stern, connected by an endless chain. The index on the bow dial being set to a given point of the compass, the same point is unerringly and instantaneously indicated on the stern dial, and the steersman changes the course of the vessel to the given point.

335. Patent Windlass; G. D. Davis.
See Model, No. 122.

336. Patent Ships' Capstan; W. Cunard, Halifax, Nova Scotia. Exhibited by W. and J. H. Johnson.

337. Improvements in Chains for Cables; Edwards, Abenbury Forge, Wrexham.

In this chain the links are formed so that the pile or fibre of the iron will run longitudinally round every link so as to obtain uniform strength throughout. To insure this it is proposed to roll the bars of iron oval or slightly flattened both sides, so as to indicate the top and bottom

of the pile of iron. A strong spring stud is used, which is lighter than the solid stud, and has the advantage of giving the chain considerable elasticity.

338. Patent Military Tents; Capt. G. Rhodes.

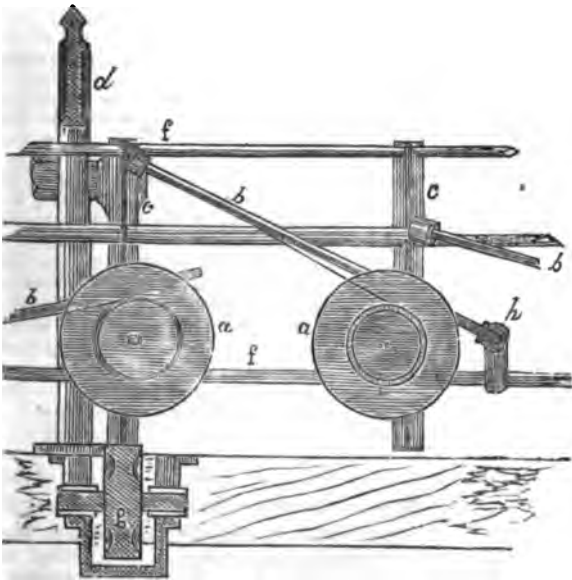
See Model, No. 136.

339. Improvements in Founding Submarine Works; J. R. Winder, Admiralty Pier Works, Dover.

340. Patent Rope Machine; Archibald Smith.

The peculiarity of this patent consists in the angular position of the frames containing the reels, by which means much useless friction on the wire is avoided, by its being brought directly to the periphery of the revolving frame, and the length of the machine considerably reduced. Fig. 4 is a longitudinal section of one reel frame, &c.—A, reel; B, frame; C, ring or disc; D, guard frame; *f*, tubular distance pieces between each ring or frame; G, roller supporting ring C; *h*, bearing for end of frame *b*. The wires or strands pass from A through hollow ends of frame *b*, and ring C, and through holes in each ring till it reaches the foremost one, thence to the laying plate, as in the machine above described. The bobbins being hung below the centre of their frames, are prevented from being carried around by the revolution of the frame. (See Model No. 104.)

Fig. 4.



341. Patent Rope Machine; Archibald Smith.

This invention relates to the manufacture of flat wire ropes, and is divided into three distinct operations. 1stly. The manufacture of a right and a left-hand strand or rope by one machine. This is accomplished by the machine. Figures 1 and 2 having in each compartment two reels, the wires or strands from one set being led to-

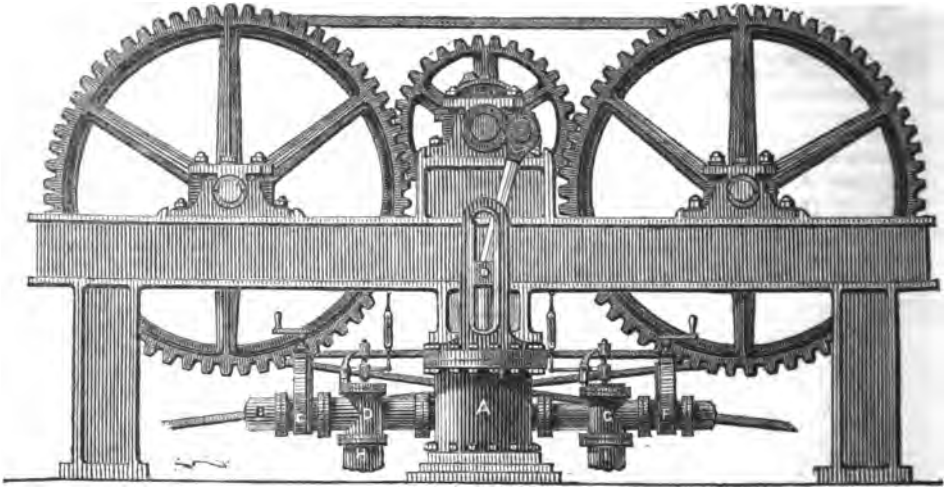
wards one end, and those from the other set towards the other end; also by having a laying plate, &c., at each end, and a double draw-off apparatus, the method of mounting the frame or friction rollers being similar to the above-described machine. 2ndly. The laying up of the required number of round ropes, and simultaneously stitching them together, so as to form a flat rope. Figures 1, 2, 3 and 4, sheet No. 2 (drawing), are a side elevation plan and end views of the machine for that purpose, which consists of six horizontal laying machines, mounted in frames, and geared together, so that each alternate machine revolves to the right and left hand. The strand being placed on the reels, F. G. H, are led from the machine to a frame, *m*, where they are spread asunder in such a manner as so permit the passage of a reel, Q, which is passed from one side to the other every quarter turn of the machine, thus stitching the round ropes together to form a flat rope. X is a draw-off apparatus, working in connexion with the machine. Figures 23, 24, 25, 26, and 27, represent another modification of the machine, the arms being substituted for the frame, *m*. Figures 3, 7 and 9, show a machine for unlaying, stitching together, and laying up round ropes previously made. The round ropes are wound in reels, and the ends opened and passed through the frame, *m*, as in figures 1 and 2, the stitching and drawing-off apparatus being similar. (See Model No. 104.)

342. Improvements in Apparatus for Paying-out and Drawing-in Electric Telegraph Cables; Benjamin Beale, 7, Lambton-terrace, East Greenwich, S. E.

The improvements consist of an arrangement of machinery that will act as the retarding apparatus, when paying out the cable, by forcing or drawing, or by forcing and drawing air, gas, water, or any other fluid, which apparatus will act as the motive power engine for hauling in the cable, when the pressure of steam, air, gas, water, or any other fluid is applied for such purpose. The woodcut represents a front elevation of a machine constructed with two pairs of grooved pulleys, having the cable wound round them. A is a cylinder, fitted with a metallic piston and a slide valve, the latter wrought by an eccentric, similar to a full pressure non-condensing steam-engine. Three of these engines are preferred in connexion with the same crank shaft, with the cranks set at equal angles with each other, to insure steadiness of action. B is an inlet pipe, in connection with a small air vessel at H, and, in common with the three cylinders, fitted with a stop valve C, and vacuum valve D, having a lever and a Salter's spring balance attached. E is an outlet pipe, in connection with a small air-vessel at I, and in common with the three cylinders, having a stop valve F, and escape-valve G, also fitted with a lever and a Salter's spring-balance; this outlet pipe is connected with a suitable boiler, which is to supply steam when the apparatus has to be used for hauling in the cable. The motion of the machine is given by the running out of the cable, which turns the wheels with the shafts and cranks, which, through the intervention of the connecting and piston rods, give a reciprocating motion to the pistons, drawing air (the stop valves being closed) into the vacuum valve

D, and forcing it out through the escape valve G. If the vacuum and escape valves be open, the

strain on the cable will be but little more than that due to the friction of the machine.



343. Apparatus for Paying-out Submarine Telegraph Cables; L. Gisborne and H. C. Forde.

See Model, No. 106.

344. Buenos Ayres Gas-works Retorts (W. Bragge); E. T. Belhouse and Co., Manchester. Exhibited by W. and J. H. Johnson.

345. Patent Gas Top; W. Oakes, 115, High-street, Stockton-on-Tees.

In this invention the gas is collected and conveyed away from the centre of the furnace instead of from the side, as is ordinarily the case.

346. National Gas Apparatus; J. T. B. Porter, Lincoln.

See Model, No. 80.

347. Patent Reciprocating Drilling Machine; Batho and Bauer, Salford, Manchester.

This machine is intended for drilling cotter-holes in connecting rod ends, key-ways in shafts, and a variety of similar kinds of work, as well as for drilling and boring generally. The spindle being so near the face of the cross-slide, great steadiness is obtained, and the enlargement of the ends of the slots is avoided. The space being clear between the uprights, large objects can be admitted. The table is of the telescopic form, and is easily raised or lowered, and has a transverse slide at right angles to the cross-slide; it can be removed altogether out of the way for large work to be fixed on the baseplate. The working parts are readily adjusted, being easy of access.

348. Patent Moving Cylinder $6\frac{1}{2}$ -ton Steam-Hammer; John Condry, Gowan Bar Iron

Works, Glasgow. Exhibited by W. and J. H. Johnson.

This hammer is designed for forgings of the largest class.

349. Patent Blowing Engine; Edwin F. Jones, Redcar.

A 50-inch blowing cylinder is placed upon two side framings, with 18-inch steam cylinder above, and discharges 6,500 cubic feet of air per minute. The annular casing around the blowing cylinder works in equilibrio, being carried by the pressure of the blast acting upon the concentric ring cast on to the bottom of the blowing cylinder; the casing is driven by two side rods attached to crank pins in fly-wheels; hence, when the blowing piston ascends, the air in the cylinder above the piston is forced out through the upper ring of ports into the shallow chamber of casing (which has a constant communication with the air main), and from this chamber the compressed current escapes through a side port in the external face of the casing, and thence into the branch leading to the main. Whilst this is going on, fresh air is passing into the cylinder below the piston, through the uncovered lower ring of ports, and as the blowing piston returns, the converse occurs.

350. Method of Uniting Metallic Plates; John Coutts, Newcastle-on-Tyne.

This invention is principally applicable to iron shipbuilding, and consists in introducing an elastic substance into the joints, in conjunction with a peculiarly formed bolt and nut, the nut having a concavity on its face for receiving an elastic ring, and the bolt, a recess in its head, by which it can be turned.

351. Patent Winding Machine; Robertson and Orchar, Wallace Foundry, Dundee.—Exhibited by W. and J. H. Johnson.

352. Modification of the Jacquard Loom; Alfred Barlow, 25, Darley-street, Leeds.

The object of the present modification is to produce various twills, figured, designed, &c., by self-acting means, an outline only of the design being required, the repetition and combination of the twills, &c., being effected by the machine itself. This is accomplished, as shown in Drawing No. 1, by passing the horizontal needles of the Jacquard through vertical slots in the needle-board, and perforating the cylinder with two or more varieties of twills, &c., so placed on the surface of the cylinder that when the horizontal needles remain at the bottom of the slots they will be acted on by one variety of twill or satin only, but if all or any portion of the needles be raised in the slots, then they will be acted upon by any other variety of twill, &c., opposite to which they may be placed. The design is cut out of leather or other material of requisite thickness, and tacked to the surface of the pattern cylinder as shown. This cylinder is placed immediately under a set of vertical needles, through the eyes of which the horizontal needles are passed. When the pattern cylinder is raised, the design on its surface will raise the vertical needles above it, consequently one portion of the horizontal needles will be acted upon by one variety of twill, &c., and the other portion by another variety, and as the cylinder revolves slowly after each action upon the needles, the whole surface of the design will be acted upon in succession. Drawing No. 2 shows a section of an ordinary Jacquard power loom, to which the above system has been successfully adapted. By regulating the speed of the pattern cylinder, the design may be woven in any given "count" or relative proportion of warp and weft. The pattern cylinder shown (full size) is equal in extent to 450 cards, and the relative cost will be apparent from the two modes of producing the same design, as shown on Drawing, No. 1.

353. Patent Check Loom; M. A. Muir and J. McIlwham, Anderston Foundry, Glasgow. Exhibited by W. and J. H. Johnson.

354. Patent Dust Exhauster; C. Nightingale, Wardour-street, W.

This drawing exhibits the dust exhauster as applied to a rag breaker. It consists of a hollow gauze cylinder (from the centre of which the dust is exhausted) revolving over a delivery cloth. The objects which it effects are the removal of the dust, both from the rags broken and the breaker room.

355. Patent Machine for Glazing Paper continuously in the web or length; J. C. Martin, Fern-cottage, Charlewood-road, Putney, S.W.

This apparatus consists of a pair of metal cylinders or endless plates fitted loosely over ordinary glazing rollers, and which revolve with the motion of the rollers against each other, always presenting a continuous glazing surface to the paper as it passes between them. This arrangement of the glazing plates admits of the rollers being heated by steam, and the paper glazed of any required length. To prevent

the creasing, a plate of metal lined with leather is fixed over about two-thirds of the circumference of the upper glazing plate, and over this the paper is drawn by the motion of the rollers before passing between the plates. The paper as it passes over the fixed plate is covered with a sheet of canvass. The object of this is to present a large fixed or resisting surface to the paper as it passes over the roller, immediately before receiving pressure.

356. Patent Brick-making Machine; R. Grey, Newcastle-on-Tyne. Exhibited by W. and J. H. Johnson.

357. Plan for Constructing and Arranging Roads and Ways for relieving the Traffic of London; Charles Baylis, 32, Poultry, E.C.

358. Machinery for the Cultivation of Land by Steam-power; Thomas Keddy, Handsworth, Staffordshire.

This drawing is to the scale of one inch to the foot. Fig. 1 is a side elevation of the machine; and its chief features are—1. A spring *a* over the guide wheel *b*, so that an equal pressure may be given notwithstanding inequalities of the soil. 2. An endless metallic platform, *c d*, extending the whole breadth beneath the boiler, presenting a surface to the earth of upwards of thirty superficial feet. There are large fluted rollers, *e f*, over which the platform *c d* moves, and small rollers, *g h*, press upon the platform, which give an equal bearing to that portion immediately in contact with the ground; it has a broad wheel, *i*, on each side, upon which, and the guide wheel *b*, the whole weight of the machinery can be raised by hydraulic or other power, and geared for turning upon new ground at the land's ends. 3. Vertical rotatory screws, or tillers, *k*, follow in a line, at right angles to the line of draught, and may be raised or lowered to any required depth. 4. An oscillating or zigzag harrow follows. There is a plate of iron, *l*, to which is fixed a number of prongs, *m*, and by drawing a lever these prongs pass through the fixed plate *n*, and are perfectly scraped. Curved prongs, *o*, collect the weeds or twitch, which may be deposited at pleasure by drawing forward the lever *p*. Fig. 2 is an end elevation of *k* in Fig. 1. Fig. 3 is a plan of *l n*, Fig. 1.

359. Archimedean Cultivator; J. James Cousins, Leeds.

This is an arrangement for working a cutter formed like an Archimedean screw, in advance of the ploughshare.

360. Patent Centrifugal Corn Dryer; J. C. Sinclair, Elgin.

In this apparatus the grain is deposited in a revolving chamber in such a manner that the stubble ends are next to the outside of the arms, whilst the tops or corn ends overlap each other so far in the middle as to keep the layers tolerably level, the damper samples being disposed at the parts nearest the extremities. When steam is at hand, a jet can be conveyed into a

perforated chamber in the centre of the apparatus, to aid in drying the grain as well by the direct-steam heat as by the aerial current, which may thus be produced in contact with the grain. The aerial current can be rendered drier by causing it to flow over layers of muriate of lime, or other matter having a powerful affinity for moisture. By these means, and by using waterproof covers to protect the grain in transit from the drying machine to the stack-yard, and a temporary stage or canopy over the "steddle," stack building may safely proceed in the wettest weather.

361. Patent Hot Air Stove; Edwin F. Jones, Redcar.

In this stove the flame or gas passes (as shown in the Drawing) in the direction of the arrows, first through the holes in the arch above the fire-grate, into the body of the oven. After heating the external pipes the heat passes through the internal pipes of the top tier, thence down the flue, through the bottom tier, into the chimney. The air to be heated enters as the inlet divides in the cross main (see Plan), and passes between the internal and external longitudinal mains down the vertical branch, and likewise back through the bottom tier into the outlet, perfectly heated to the blast furnace. The advantages are stated to be — 1st. Double-heating surface, with half the weight of iron. 2ndly. Heating the air in strata. 3rdly. A saving of positive power, owing to the larger area of the air

passages and few bends, and economy of fuel. At one end is fixed a metallic joint, to allow for any difference of expansion between the external and internal pipes.

362. Patent Three-wheeled Omnibus, with Self-acting Break; G. and W. Richardson, 2, Copenhagen-street West, Islington, N.

363. Patent Indicator for Omnibuses; Francis Parker.

See Model, No. 73.

364. Fin-expanding Canopy for Carriages, &c.; T. L. Scowen.

See Model, No. 76.

365. Bathing and Swimming Sandals; J. Davis.

These sandals are designed to protect the feet while bathing, and also to assist in swimming.

366. Patent Elliotttype Photographic Process; R. Elliott, Newcastle.

The specimens consist of copies of oil paintings produced from glass negatives, with the lights of the pictures copied or traced on the surface with some pigment.

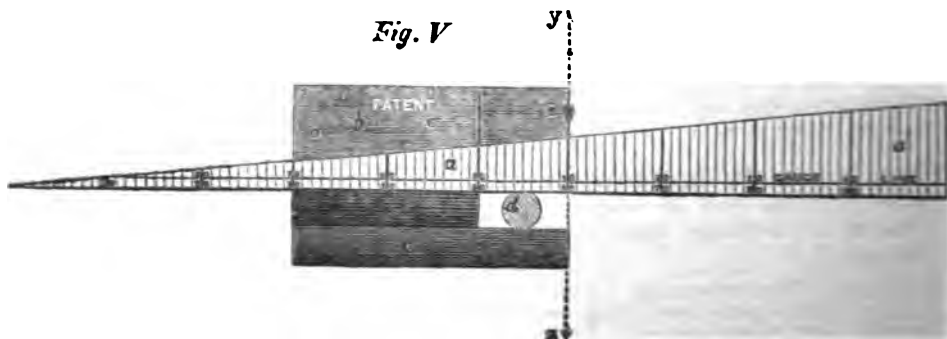
367. Patent Triangular Scales and Guages; R. E. Hodges, 44, Southampton-row, Russell-square, W.C.

The drawing represents a strip of wood or metal 10 inches long and 1 inch wide, with a diagonal cut severing it in two. Each inch is divided into 10, and the whole into 100 parts. Each move of the 10th of an inch of one triangle upon the other, whether backwards or forwards, must decrease or increase the width of the scale 100th part of an inch, and the scale will be parallel in

the parts which overlap each other. The guage plate, Fig. 5, will give the diameter of needles, wire, screws, round iron, and lathe work, and also the thickness of paper, sheet metal, &c. Tubes (as gun-barrels) may be guaged internally from one end to the other by a simple arrangement of sections of these triangles.



Fig. V



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